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"Take a Sad Song and Make It Better": Exploring Rewards Related to Liking Unfamiliar Sad Music

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“TAKE A SAD SONG AND MAKE IT BETTER”: EXPLORING REWARDS RELATED TO LIKING UNFAMILIAR SAD MUSIC

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This thesis reports the results of an experimental design study with a pilot study to determine if benefits occur from listening to music that makes the listener sad.

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This thesis tested some of Levinson’s (1997) ideas on why people like music that makes them sad. A path model of this effect was interpreted from Levinson’s theory, and 5 of the paths were tested. These paths were that music would directly create a communion with the song, that happiness and sadness would mediate this effect, that absorption would moderate the direct path, that absorption would moderate the songs’ ability to evoke the emotions, and that satisfaction would moderate the emotions’ influence on liking the songs.

A pilot study was conducted to determine if the songs evoked their intended emotions. The pilot study included 6 songs: two fast, major songs to induce happiness; two repetitive songs intended to be neutral; and two slow, minor songs to evoke sadness. One song for each condition was retained for the primary study. All participants listened to all three songs in a counterbalanced order and completed a measure of absorption in a counterbalanced order.

The music did not directly cause a change in communication scores, but happiness mediated it. Sadness did not. Absorption did not moderate the direct path, either. It also did not moderate the songs’ ability to evoke emotions. Satisfaction did not

moderate happiness's effect on liking, but it did moderate sadness's effect, where people with high satisfaction liked the song less as sadness increased. Satisfaction overall positively predicted liking the songs, regardless of the evoked emotion.

Only Levinson's (1997) reward of Savoring Feeling was supported in this study. The significant results suggest that nonmusical outcomes from unfamiliar music are directly related to the amount of happiness one feels from the music. Liking songs regardless of the emotional content increased as satisfaction increased. Therefore, liking a sad song may be a function on how much satisfaction one feels with the song as long as one does not feel too much sadness from the song.

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JOHN D. HOGUE

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J. D. H.

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CHAPTER I

INTRODUCTION

Songs that evoke sadness in people are often very popular even though they leave people feeling worse than when they started listening to the songs. Take for example R.E.M.'s *Everybody Hurts,* which peaked at number 29 on Bilboard's Hot 100 list in 1993 (billboard.com, 2012). Seventeen years later, this song was chosen on an online PRS for Music survey of 1757 respondents as the number one song that made men cry (PRS for Music, 2010). Another example is Adele's *Someone Like You.* According to the Recording Industry Association of America (RIAA, 2012), the song was released on February 22, 2011 and went quadruple platinum almost a year later. The song is so heart wrenching that when Teitell (2012) interviewed people about their experiences with it, some reported crying in public when they heard it. One person's response, however, was very poignant: "I love it," she said, "but it brings me to a place I don't want to visit" (par. 6).

If these songs are so provocative and good at inducing negative emotions, why, then, do people continue to listen to them? Salimpoor, Benovoy, Larcher, Dagher, and Zatorre (2011) may have found an answer involving dopamine levels. These authors used participant-chosen music and found that intense emotional states release dopamine in the NAcc region, and this region is connected to elation from psychostimulants (Volkow et al., 1997) and is connected to other parts of the brain that mediate emotions (Haber & Knutson, 2010). Salimpoor and colleagues determined that the intense emotions were related to pleasure; they do not specify if these intense emotions are positive or negative, but positive emotions evoked by music have been shown to activate the same neural pathways involved in reward systems as food, sex, and pharmacological drugs (Blood & Zatorre, 2001).

If songs that evoke intense emotions become addicting and pleasurable, then that would explain why people repeatedly listen to songs that evoke sadness and would fall in line with the Opponent-Process Theory, which states that newly acquired motives are realized through the emotional states (Solomon, 1980). When relating his theory to addictive stimuli (the music), the theory surmises that the endorphins released into the system from the stimuli would be a reward from a negative state (sadness). This reward would then be positively reinforcing. Given that emotional arousal could be manifested from endorphins, which reduce pain (Liss & Liss, 1996), using the Opponent-Process theory to explain why people like sad music seems plausible: they are positively rewarding themselves from the negative stimuli.

If there are rewards or benefits from negative stimuli or emotional states, then the question becomes this: Other than released dopamine, what other benefits do people reap from listening to sad songs? Smuts (2011), Levinson (1997), Davies (1997), and Kivy (1989) all theoretically state that there must be some benefit to listening to sad music; otherwise, people would not listen to it. Therefore, the current study sought to determine if sad music can be a rewarding, beneficial experience through creating rewards based on liking the sad song, rewards such as satisfaction or a nonmusical outcome of intimacy (communion) in its listeners.

CHAPTER II

REVIEW OF RELATED LITERATURE

General Literature Review

Whereas musical outcomes are related directly to music (better performances and writing songs), nonmusical outcomes are achievements obtained from a musical procedure that is not related to music, such as increased range of motion and improved cognitive functions (Clair & Memmott, 2008), and there appears to be a process of obtaining nonmusical outcomes through listening to music. The entire process begins with the music and its properties, because the way songs are written have an enormous impact on how people react to them. Some theories have wrestled with the topic of liking and emotional valence; these theories have also investigated the process of obtaining nonmusical outcomes of listening to sad music.

Philosophical Background

Davies (1997), Levinson (1997), Kivy (1989), and Smuts (2011) are concerned with the paradox of liking sad music. The paradox with which they are concerned is that people like sad music even though it negatively affects them, which should not happen because people typically avoid negatively reinforcing stimuli. All four philosophical frameworks differ in their beliefs about what a person actually attains from listening to sad music.

Smuts (2011) suggests that people actually listen to feel worse. In other words, he suggests that people want to feel sad; they want an anticatharsis, because the increase in negative affect would expose a personal need that the person can choose to attain or to clearly understand something. An example he provides involves not being able to understand the loss of a child until one has strongly felt sadness and grief, which would be a nonhedonic reward. Examples of hedonic rewards would be Levinson's (1997) suggestions that people are rewarded through listening to sad songs by liking the emotional experiences (positive or negative), gaining an understanding of emotions through practicing emotions, resolving emotional turmoil, engaging in a catharsis, creating a need for intimacy, and allowing an emotional conversation to occur.

Similar to Levinson's suggestions of these outcomes from listening to sad music, Davies (1997) advocates that people are motivated to listen to sad songs for the enjoyment of the process even though it leaves the listener feeling worse, but he believes positive reinforcement through a negative song is an incomplete idea; for him, the enjoyment comes from the process, not the product, which could be either positive or negative. Finally, Kivy (1989) postulates, and the general consensus between the theories agrees, that the positive rewards of listening to the sad songs are greater than the sadness that is inevitably evoked. In fact, all four of the liking-sad-music theories state that there must be some benefit to listening to sad music; otherwise, people would not listen to it (Davies, 1997; Kivy, 1989; Levinson, 1997; Smuts, 2011).

Levinson (1997) also states rewards from absorbing oneself into the music. He believes through placing oneself in the music, one can resolve emotions, bring an emotion to full fruition as if it were generated naturally, and commune with the music (reward of intimacy). The last reward is described as a "…sense of intimate contact with the mind or soul of another..." (p. 236); it is described as connecting with the composer through the song to stop feeling alone in real life. This reward, however, may be a benefit of both sad and happy music. All of these philosophical connotations appear to coincide with Solomon's (1980) Opponent-Process Theory that out of the negative state of sadness, something positively reinforcing is created.

The Opponent-Process Theory states that an unconditioned stimulus creates an emotional reaction in a participant. This emotional state ends when the stimulus resolves, but the participant slowly changes to a different emotional state, which is slow to fade. The new state is the opposite of the first state created by the stimulus. In other words, if a song creates a negative state of sadness in an individual, then that sadness will be followed by a positive state. However, if a song creates a positive state of happiness in an individual, then that individual will experience a negative state following the removal of the stimuli and the reduction of the emotion (Solomon, 1980). Therefore, according to this theory, people listen to sad music, because the music creates sadness, and this sadness creates a positive state, which becomes positively reinforcing.

The Opponent-Process Theory also purports that the rewards in the second state must be correlated with the strength of the first state, that changes in the strength of the second state are correlated with changes in the first state, and that the changes only come from the repetition of the stimuli. The person reacting to the stimuli, however, eventually habituates to the repeated stimuli making the person constantly looking for new sources of pleasure from a negative stimulus. According to this theory, the repeated positive stimulus can eventually become a source of physiological stress (Solomon, 1980). For example, overexposure to music can increase heart rate (Landreth & Landreth, 1974), cause fewer changes in mood (Livingstone, Palmer, & Schubert, 2012), and decrease liking during focused listening (Schellenberg, Peretz, & Vieillard, 2008; Szupunar, Schellenberg, & Pliner, 2004).

Accordingly, Levinson (1997) argues that because everyone reacts differently to music, conditions need to be met before the listener can achieve an emotional response. First, the stimuli need to be of a familiar style, but they cannot be familiar enough for habituation to occur. Second, the listener must be absorbed in the music, and, according to him, this is crucial to the aesthetic appraisal. Third, the listener has to be open to the musical experience; he or she has to be willing to be moved by the music.

Creating the emotion is important. As Levinson (1997) argues, nonmusical outcomes from music are at least partially mediated by the emotional response. For sad music, the negative affect created from the music is thought to cause the rewarding nonmusical outcomes.

Moreover, Levinson (1997) argues that listeners can feel satisfaction from the sadness. In other words, we savor the negative emotions, practice different negative emotions, and gain an understanding of them, so that we feel the negative state of sadness and are then positively reinforced with feeling satisfaction. Emotional practice is stated to be more a result of negative emotions and not positive. Levinson discusses satisfaction as both a mediator and a moderator. He clearly states that emotional states from music can cause satisfaction, which can cause liking. Upon further reading, he suggests that if we can find satisfaction in the emotions and if the emotion is not too intense, then listeners will be positively reinforced and like the song. Unfortunately, he leaves the reader to infer that the more satisfaction the listener has with the song, the more he or she will like it. See Figure 1 for an overview of this process.

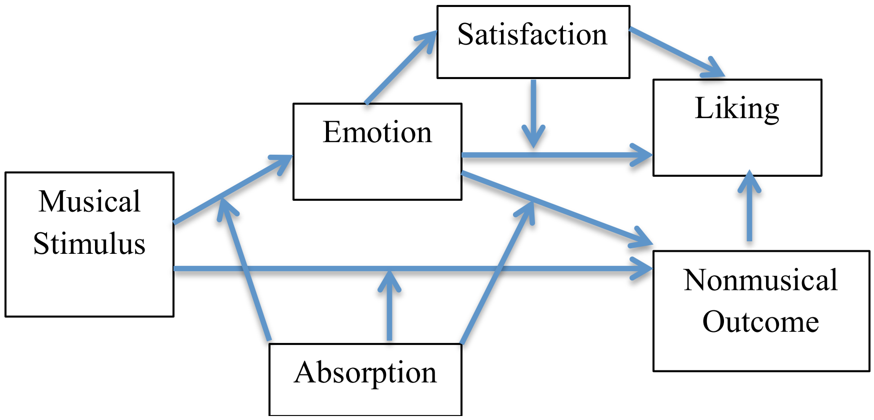

Figure 1. Path Diagram of Levinson's Ideas. This is a path diagram showing Levinson's (1997) ideas of liking sad music.

Effects of the Collative Properties of Music

As with any process, there must be a beginning, and creating nonmusical outcomes from music begins with the physical properties of the written music. Fast tempos have been shown to induce happy emotions, and slow tempos have been found to induce sad emotions (Hunter, Schellenberg, & Schimack, 2008, 2010; Larsen & Stastny, 2011; Webster & Weir, 2005). This pattern also exists for major modes inducing happiness and minor modes inducing sadness, as well. Furthermore, sad songs have a slow tempo in a minor tonality, and happy songs have a fast tempo in a major tonality (Hunter et al., 2008, 2010; Krumhansl, 2002; Larsen & Stastny, 2011; Lundqvist, Carlsson, Hilmersson, & Juslin, 2009; Webster & Weir, 2005). Music only has a moderate effect on emotion induction, but it is equally effective comparing sadness and happiness (Westermann, Spies, Stahl, & Hesse, 1996), as people may depend upon the melody for the happy and sad distinction rather than entraining to the tempo (Khalfa, Roy, Rainville, Dalla Bella, & Peretz, 2008) by responding to nonharmonized melodies with happiness and harmonized melodies with sadness (Webster & Weir, 2005).

Other properties such as the instrumental composition of the pieces and the lyrics have also been shown to have an effect. Edelman, Helm, Katz, and Matcher (2009) found that horns and flutes regardless of modality made a song sound happy and that violins regardless of modality made a piece sound sad. Horns were also found to be exciting, and violins were not. The type of music and the presence of lyrics have been shown to decrease mood. While using text regarding war and death, significant decreases in mood were found for atonal music with and without text and commercial music with text. Moreover, these decreases in mood were shown to change as a function of semantic evaluation, which was a semantic differential created from changing Asmus's (1985) *Nine Affective Dimensions* scale. Evaluation was strongly, positively correlated with liking. Also, as scores on evaluating the music went down, the stronger the change in mood was (Gfeller, Asmus, & Eckert, 1991).

Altogether, these properties may take as little as 1 s to induce an emotion (Bigand, Vieillard, Madurell, Marozeau, & Dacquet, 2005), and when these tempos and modes are mixed, slow and major or fast and minor, for example, the music produces a mixed reaction of happiness and sadness within the individual (Hunter et al., 2008; Larsen & Bradley, 2011). Tempo alone may not have an effect on mood (Husain, Thompson, & Schellenberg, 2002). In fact, Hunter et al. (2008) investigated the link between tempo and modality. They played songs with different combinations of fast and slow tempos and different modalities and found that only sad feelings needed both tempo and modality to induce the emotion; happy, pleasant, and unpleasant feelings did not need the interaction between modality and tempo. Slow tempos, however, appear to cause slower completion times on creative projects compared to fast music (Ilie & Thompson, 2011). Finally, neutral music, music that has no emotion-inducing qualities, is often operationally defined in the experimental literature as repetitive, monotonous, uneventful, and unexpressive (Alfredson, Risberg, Hagberg, & Gustafson, 2004; Silvia & Abele, 2002).

Even though slow music in a minor modality creates sadness, this music can evoke peacefulness in the listeners in addition to sadness (Vieillard, Peretz, Gosselin, & Khalfa, 2008; Vuoskoski, Thompson, McIlwain, & Eerola, 2012), as well as nostalgia and wonder (Vuoskoski et al., 2012), showing that positive experiences occur as well as negative. Hunter et al. (2008) found an association with musically evoked sadness and unpleasant ratings, but listening to slow, minor music can also be seen as a pleasant experience while still evoking sadness; it is not, however, as pleasant as listening to fast, major music (Khalfa et al., 2008; Vieillard et al., 2008). These findings suggest that listening to slow, minor music can be an emotionally positive experience.

Effects of Emotions

The next step in this process involves the emotions felt while listening to music. Emotions generated from the music may mediate the musical stimuli’s effect on nonmusical outcomes (Levinson, 1997). It could be that the collative properties create an emotion and then the emotion creates the nonmusical outcome (Ilie & Thompson, 2011; Hunter, Thompson, and Schellenberg, 2002; Thaut, 2005), and for the purpose of this experiment, the nonmusical outcome will be Levinson’s (1997) communion with the song, which is his reward of intimacy. In the Husain et al. (2002) study, they believed that the mode and tempo would lead to arousal, enjoyment, and mood, which would lead to a nonmusical outcome of enhanced cognitive performance. Instead of using a test of mediation to determine the accuracy of this statement, the researchers used hierarchical regression, but it does show that moods from music can predict nonmusical outcomes. They determined that mood, arousal, and enjoyment predicted about 58% of the variance in the nonmusical outcome scores. Above those scores, mode and tempo predicted another 12%. However, Ilie and Thompson (2011) found that emotions do not mediate the collative properties' effect of affecting completion times on creative tasks, but they used Baron and Kenny's (1986) mediation guidelines to test it. Again using Baron and Kenny's guidelines, they showed that valence completely mediated the effect that pitch height has on successfully finishing a creative task. Better statistical methods need to be used to test the mediation process, but it has been shown that people often listen to music to influence their emotions: most to increase positive and decrease negative emotions, but a small amount tries to increase negative emotions and decrease positive (Juslin et al., 2011).

In fact, it has been found that negative affect can cause an increased sensitivity to even looking at a picture of people touching each other (King & Janiszewski, 2011). Also, induced negative affect caused better memory on word recall, but this included fear response as well as sadness (Finn & Roediger, 2011). Finally, van Knippenberg, Hanneke, Kooij-de Bode, and van Ginkel (2010) showed that groups who were induced with sadness by thinking of sad events made better decisions than groups in a positive mood, but this effect was only the case when the negative affect was low instead of high. Depression is even thought to have an overall benefit of better problem solving through rumination (Andrews & Thomson, 2009).

Although these benefits were not from music-induced sadness, Schellenberg et al. (2008) showed that people who listened to slow, minor background music while performing a cognitively demanding task remembered hearing more songs than those who listened to fast, major background songs. Hunter et al. (2010, p. 55) even stated, "…the therapeutic value of sad-sounding music may be underrated," despite evidence suggesting that slow, minor music has been found to have negative effects (Heatherton, Striepe, & Wittenberg, 1998; Martin, Nathan, Mileck, & Keppel, 1988; Pignatiello, Camp, & Rasar, 1986; Teasdale & Talor, 1981), which can last for 10 min (Panksepp & Bernatzky, 2002).

Effects of Feeling Satisfied

One reason more nonmusical outcomes from slow, minor music have not been found could be that satisfaction during the listening process has not been used as an outcome in the evaluation. Levinson (1997) states that we are capable of feeling satisfaction in and from the musically evoked sadness, but we will like the music less as the intensity of the sadness increases. If the participants determine the music to be highly satisfying, then they will engage in the music, and the music will create stronger nonmusical outcomes; thus, satisfaction motivates the participant to continue (Clair & Memmott, 2008). For example, Galizio and Hendrick (1972) found that playing guitar during a speech made the participants more accepting of the information and that satisfaction scores were higher when the guitar was present than when absent. They postulated that a positive arousal, which included satisfaction, mediated the nonmusical outcome of accepting the information. Moreover, positive mood has been shown to predict consumer satisfaction (Teng, Tseng, & Wum, 2007); music therapy has been shown to increase satisfaction and decrease anxiety during cesarean delivery compared to routine care (Chang & Chen, 2005); and people prefer love songs that match their current satisfaction with their romantic relationships (Knobloch & Zillmann, 2003).

Because Levinson (1997) discusses satisfaction as both a mediator and a moderator, it is unclear which process is more important. The above articles discuss satisfaction in terms of a mediator, but satisfaction's role as a moderator has not been addressed. The role satisfaction plays related to sadness and creating nonmusical outcomes needs to be evaluated to determine if satisfaction is a moderator in the process of creating a form of communion with music, and the current experiment evaluated the path of moderation.

Different Preferences for Music

The next step in the process of obtaining nonmusical outcomes from music involves the participant's preference for a song or genre. Although *preference* is defined by Webster's New World Dictionary as "a preferring or being preferred; greater liking" (Agnus, 2000, p. 1133), preference for music has been defined as the collaboration of personal arousal and the specific, stimulating properties of the music (Berlyne, 1971). Preferences for types of music may be a combination of different characteristics. As pleasantness better predicts emotions from familiar music than liking, preferences may be composed of an intellectual and an emotional component. Therefore, liking can lack arousal, is only one component of emotionality, and does not include all of the properties of positive emotions (Ritossa & Rickard, 2004).

Music preference comes from a person evaluating the music, but valence involves evaluating the emotion (Schafer & Sedlmeier, 2011). In addition to tempo (Flowers, 1988), consonance and dissonance (Trainor & Heinmiller, 1998) and familiarity with the piece (Ali & Peynircioğlu, 2010; Schäfer & Sedlmeier, 2010; Zajonc, 1968) can influence whether people like a song or not. The lack of arousing (calming) features of the slow tempo or the negative affect induced by the minor mode in sad music (Schellenberg et al., 2008); the culture of origin (Soley & Hannon, 2010); the aging process (Harrison & Ryan, 2010); whether it's commercial grade or atonal (Gfeller et al., 2004); communication, self-reflections, arousal and activation, and mood and emotion (Schäfer & Sedlmeier, 2010); and if nonmusical outcomes are obtained (Schäfer & Sedlmeier, 2009, 2010) can also affect liking the song.

People generally prefer fast, major music more than slow, minor music (Hunter et al., 2010; Husain et al., 2002; Motyka, Schmidt, Isaacowitz, and Cunningham, 2009; Schellenberg et al., 2008), but not always (Schellenberg et al., 2008; Vuoskoki et al., 2012). People tend to like fast music and dislike slow music (Hunter et al., 2010). Schellenberg et al. (2008), however, found that people like slow, minor music just as much as fast, major music when the songs are in the background. They found these results by repeating the music between 0 and 32 times and asking half of the participants to focus intently on the song by rating the emotional content. The other half of the participants were asked to listen incidentally by simultaneously listening to the song while focusing on a speech, where they had to press one button every time they heard the word "the," press another button every time they head the word "and," and count the number of times they heard the word "but." In this experiment, liking and recognizing music based on feeling happiness and sadness were not affected by the number of times the songs were repeated when incidentally listening to the music but initially increased and then decreased as the number of intently listened repetitions increased. All of this shows that slow, minor music can be liked just as much as fast, major music.

Schäfer and Sedlmeier (2009, 2010) found that people generally like music that can promote nonmusical outcomes in the listener. In 2009, they found that self-reported functions of expressing identity, aiding in socializing, feeling ecstatic, expressing values, allowing art appreciation, putting the listener in a good mood, and giving the listener information predicted liking a genre of music with 47% of the variance explained. In 2010, nonmusical outcomes of communication, self-reflection, arousal and activation, mood and emotion, and repetition and familiarity, but not culture, predicted liking of a genre. In the two studies they did, these factors accounted for 91% and 88% of the variance. They did these studies by having participants listen to six different genres of music and the participants' favorite piece of music and by having them rate their experience through questions related to the above factors. Cognitive functions of music communicating information and self-reflection were the strongest predictors of preference, but the authors also noted that the song's ability to evoke an emotional response could predict the strength of a person's liking of the piece, which was supportive of theoretical models.

Furthermore, Motyka et al. (2009, 2010) broke preference for music into two categories: enjoyment and interest. In 2009, they analyzed the effects of valence and emotional intensity on enjoyment of music. They found that emotional intensity did not predict enjoyment, but this effect was moderated by emotional valence. Music that evokes a negative valence was enjoyed more as the arousal increased, but positive music was enjoyed less as arousal increase. Positive music, though, was enjoyed more than negative music overall. They believed that people enjoy listening to negative music because of the emotional sanctuary the music provides to help the listener safely explore emotions while dissociating him or herself from the negative effects of the evoked sadness, and these findings provide support for Levinson's (1997) reward of emotional practice through listening to slow, minor music. In 2010, Motyka et al. found that musical complexity, personal coping potential, one's enjoyment of the music, and the hedonic tone of the music explained 70% of the variance in interest in music, indicating that individual differences influence liking slow, minor music.

Individual Differences

Finally, individual differences have a huge effect on musical preferences, the emotions evoked from the music, and the nonmusical outcomes created from music listening process. Indeed, people who systemize the music to which they listen prefer to listen to jazz and classical music, but people who empathize a lot with the music and who have low levels of systemizing prefer easy listening pop (Kreutz, Schubert, & Mitchell, 2007). People with low self-esteem like songs with collectivist lyrics, and people with high self-esteem like songs with individualistic lyrics (Martin & Kim, 2012). More importantly, Schäfer and Sedlmeier (2011) found that although there was a small overall correlation between physiological arousal and emotional arousal, some people had positive correlations and others had negative correlations. Moreover, even though Alfredson et al. (2004) used participant-chosen music, they found that only some had intense, emotional reactions to the music. Edelman et al. (2009) surmised that even though emotions based on mode could be culturally specific, individuals respond differently in arousal to the same music. Therefore, future research on this topic should include individual factors, as it seems that involving an individual factor in music research is crucial to the process.

When it comes to individual differences in liking slow, minor music, however, Garrido and Schubert (2011) had participants rate their liking for this music in general and found that about 50% reported liking it. They determined that being high in absorption, the ability to feel emotions while disconnecting from and not being distracted by reality (Tellegen & Atkinson, 1974), was the best predictor of liking slow, minor music. However, they used a stepwise regression analysis even though they did not meet any of Cohen, Cohen, West, and Aiken's (2003) guidelines for using such a technique. Nevertheless, Motyka et al. (2010) believe that people high in absorption find slow, minor music enjoyable, supporting Garrido and Schubert's (2011) findings.

Absorption is positively correlated with emotional valence but not arousal (Sandstrom & Russo, 2011). Openness to Experience, global Empathy, and two subscales of global Empathy (Fantasy and Empathic Concern) correlate with liking slow, minor music (Vuoskoski et al., 2012), but absorption is correlated with global Empathy including Fantasy (Sandstrom & Russo, 2011) and Openness to Experience (Wild, Kuiken, & Schopflocher, 1995). More importantly, Sandstrom and Russo (2011) state that absorption may be a key moderator in evoking emotions through music, may be used as a covariate, and may have implications for music therapy and music therapy research, as people high in absorption might have a better chance of obtaining nonmusical outcomes. Therefore, given absorption's role in music and in Levinson's (1997) theory, the current study evaluated absorption's role in liking slow, minor music.

Research Questions and Hypotheses

The purpose of this experiment was to evaluate Levinson's (1997) thoughts on why people like listening to slow, minor music, which has not currently been done. The key elements of his theory are absorption, satisfaction, evoked emotions, and the eight rewards (nonmusical outcomes). Out of these rewards, this research tested only the rewards of communion and feeling satisfaction with the evoked emotion to keep the research focused. Absorption was also measured to show its involvement with how people react to classical music. See Figure 2 for the overall path diagram again. It shows that evoked emotions partially mediate the music's effect on creating nonmusical outcomes, that absorption moderates every step of the mediation, and that satisfaction moderates and mediates the effect that the evoked emotions have on liking the song.

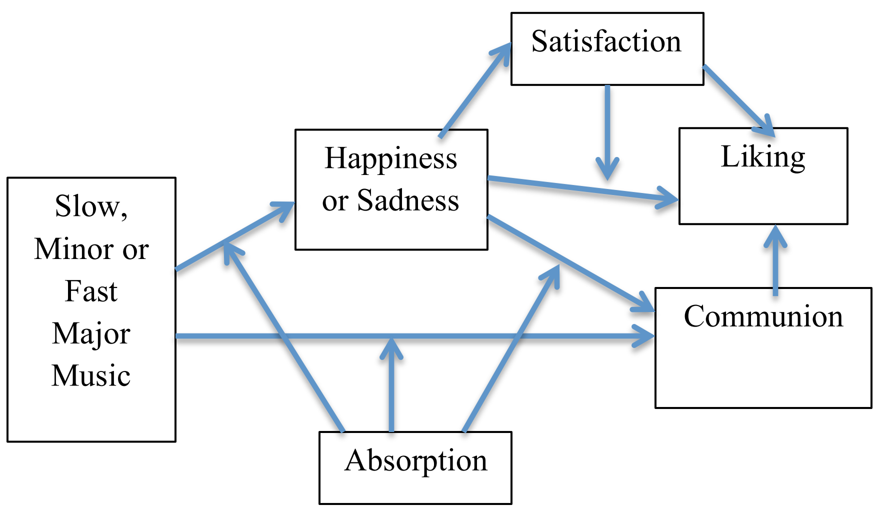

Figure 2. Overall path diagram. This is the overall path diagram of Levinson (1997).

Does slow, minor music create a communion with the song*?*

Given that nonmusically induced sadness can create benefits (Andrews & Thomson, 2009; Finn & Roediger, 2011; King & Janiszewski, 2011; van Knippenberg et al., 2010;), it is expected that beneficial nonmusical outcomes from listening to slow, minor music are within the realm of possibility because of the evoked sadness. As the nonmusical outcome in this study was Levinson's (1997) reward of intimacy as defined as a communion with the song, it is hypothesized that there will be an increase in communion when listening to the slow, minor music over listening to the repetitive music and fast, major music. Levinson and the Opponent-Process Theory (Solomon, 1980) also argue that when communion is achieved from the slow, minor music, it will be the opposite in the fast, major music. Therefore, it is predicted that communion from the fast, major song will be lower than the repetitive and slow, minor song, because the Opponent-Process theory suggests people eventually push away from stimuli that makes them happy. So, one possibility is that communion with fast, major music will be lower than with repetitive music.

Because it is postulated that sadness evoked through music may activate a different neural pattern than sadness evoked through other means (Mitterschiffthaler, Fu, Dalton, & Williams, 2007), an alternative hypothesis is also presented. For communion, Levinson (1997) states that fast, major music could engage in a nondiscursive form of communion with the listener just as slow, minor music could. Thus, an alternate possibility is that the current experiment will show an increase in communion from both the fast, major music and slow, minor music compared to the repetitive music.

Do happiness and sadness mediate music's effect of creating communion?

The above research question and hypotheses are intended to show the direct effect that music can create nonmusical outcomes. However, it is thought that music also creates emotions, which create the intended nonmusical outcome (Husain et al., 2002, Ilie & Thompson, 2011; Levinson, 1997). It is expected that happiness will come from fast, major songs versus repetitive songs, and that sadness will come from slow, minor songs versus repetitive music. It is also expected that these emotions will be mediators in creating a communion from the music, so that the sadness felt from the slow, minor music will predict the communion with the music with a slope that is positive. Happiness felt from the fast, major music will predict communion with a negative slope if this process follows the Opponent-Process Theory (Solomon, 1980) but will predict communion with a positive slope if it follows Levinson's (1997) second hypothesis. All of these predictions are compared to the repetitive music. See Figure 3 for an example.

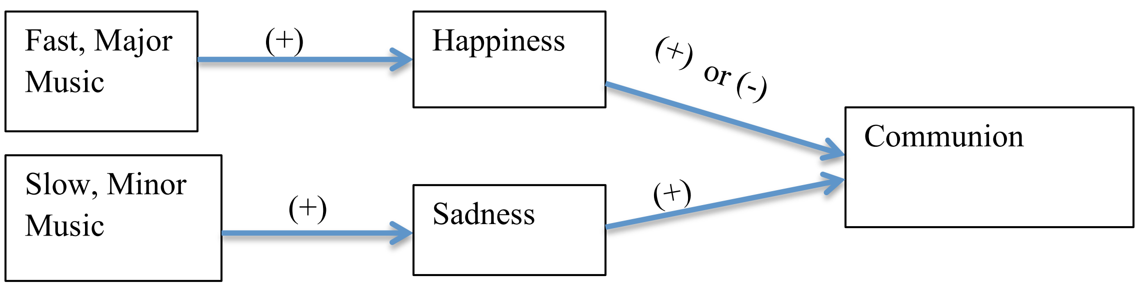

Figure 3. Emotions' mediation process between the music and communion. This figure shows the mediation process between the collative properties of the music, the evoked emotions, and communion.

Does satisfaction moderate evoked happiness's and sadness's effect on liking a song?

Levinson (1997) states that people may feel satisfaction from the sadness resulting from slow, minor music, and he implies this idea is a reason people like slow, minor music. It is expected that if people feel a lot of satisfaction, the liking scores will be higher than if they do not feel satisfied. He also states that people can have satisfaction in the sadness, and by interpreting this statement, it is hypothesized that people with high satisfaction will like the song more as sadness increases. See Figure 4 and Figure 5 for examples. However, Levinson also states that this relation only occurs if the emotion is not intense.

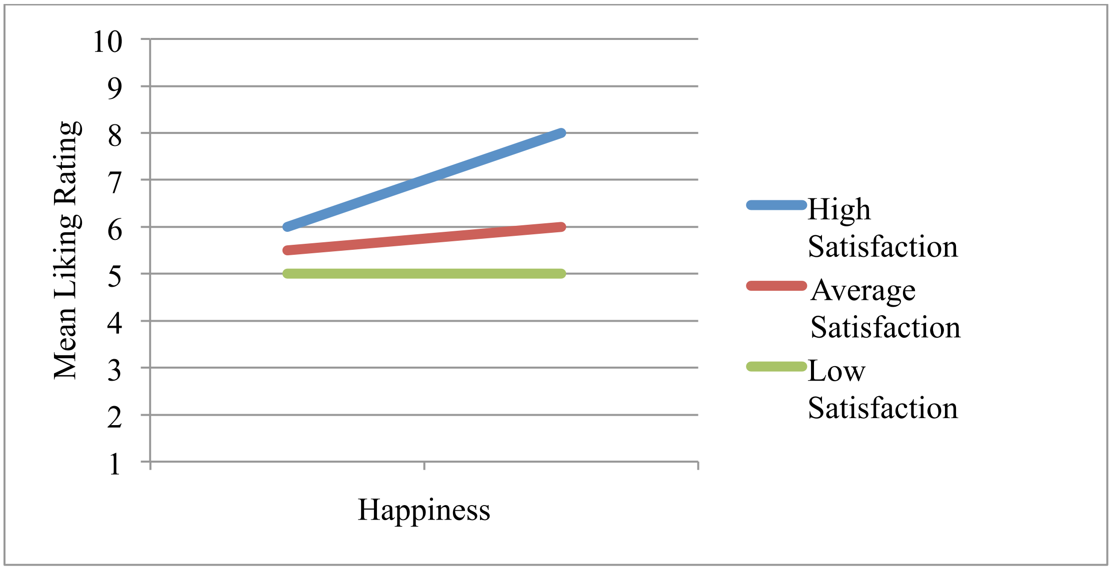

Figure 4. Happiness and satisfaction interaction on liking the song. This figure shows people high on satisfaction should have higher liking scores overall as happiness increases than people with average or low satisfaction.

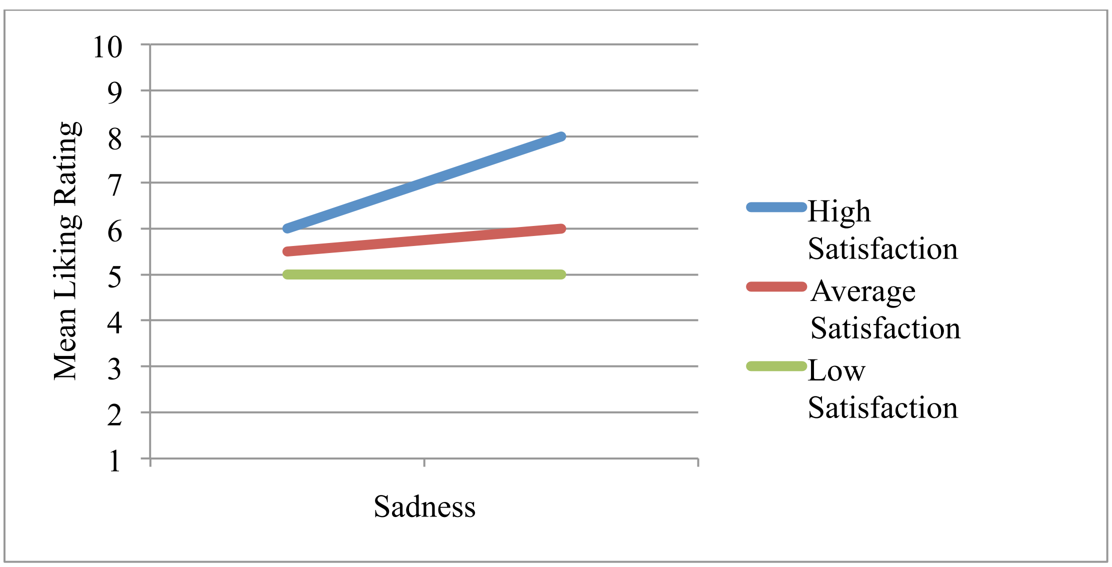

Figure 5. Sadness and satisfaction interaction on liking the song. This figure shows people high on satisfaction should have higher liking scores overall and as sadness increases than people with average or low satisfaction.

Is absorption a moderator in creating emotion and communion from music?

Because communion with music is thought to be a byproduct of the interaction between the music and the individual factor of absorption (Levinson, 1997) and because absorption is thought to be important in liking slow, minor music (Garrido & Schubert, 2011; Motyka et al., 2010) and in generating emotions and nonmusical outcomes from music (Sandstrom & Russo, 2010), it is expected that absorption will be a moderator in creating emotions and in creating a nondiscursive communion with the music. Specifically, as absorption increases happiness and sadness ratings will also increase in the fast, major, repetitive, and slow, minor songs. The fast, major song and the slow minor song will have greater increases in happiness and sadness than the repetitive song. See Figure 6 for the song-absorption interaction on happiness and Figure 7 for the song-absorption interaction on sadness.

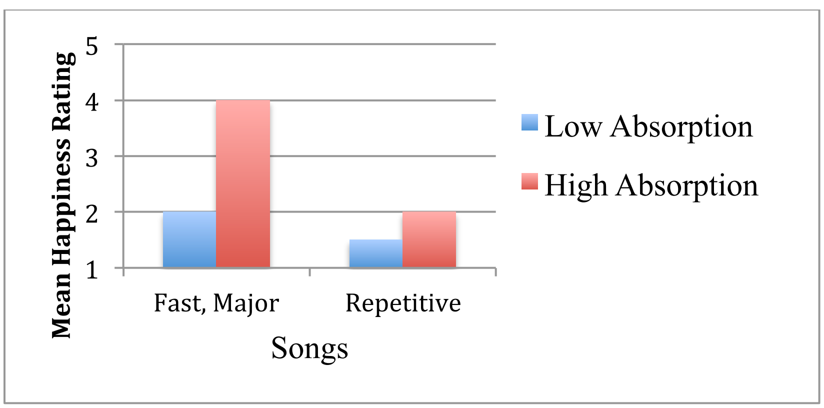

Figure 6. Song type and absorption interaction on evoked happiness. This figure shows the interaction between absorption and song type on happiness.

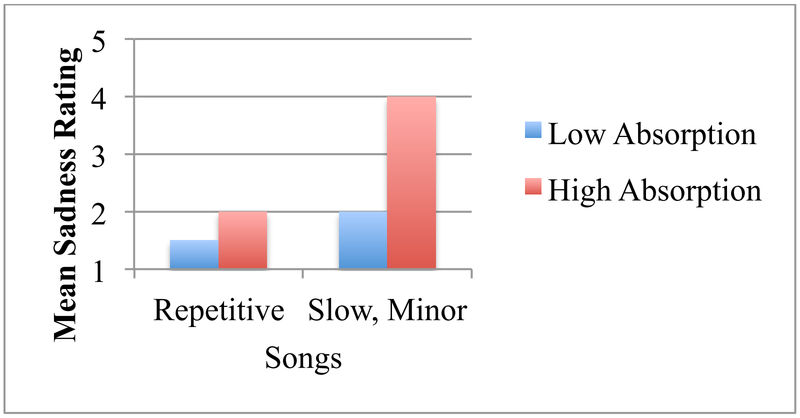

Figure 7. Song type and absorption interaction on evoked sadness. This figure shows interaction between the songs and absorption on sadness.

It is also expected that absorption will moderate the music's effect on communion. It is hypothesized that people high in absorption will have higher scores in communion than people with low absorption when listening to the fast, major and slow, minor music. No difference is expected in the repetitive music. If communion follows the Opponent-Process Theory (Solomon, 1980), then scores on communion will be highest during slow, minor music compared to repetitive and fast, major music. There is not expected to be a difference between fast, major and repetitive music. See Figure 8 for a nonverbal description.

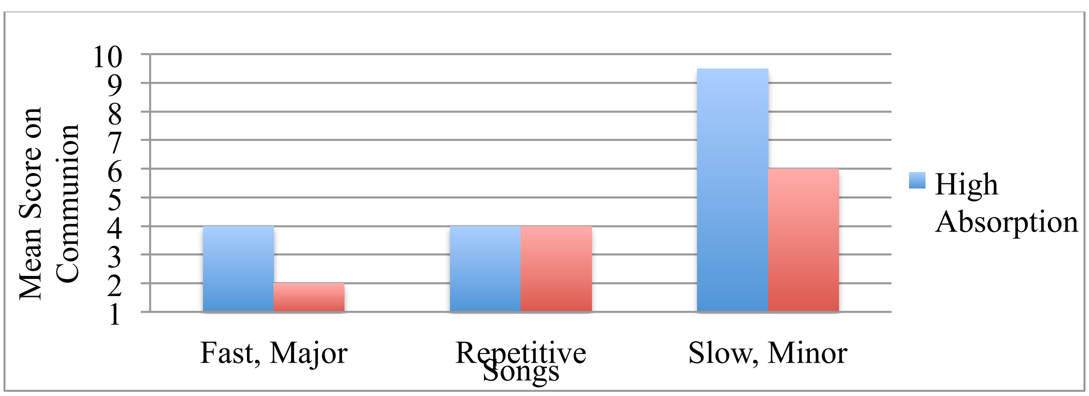

Figure 8. Song type and absorption interaction on communion following Opponent-Process Theory. This figure shows the interaction of absorption and song type on communion if it follows the Opponent-Process Theory.

If communion does not follow the Opponent-Process Theory, then it is still hypothesized that high absorption will yield higher scores in the fast, major and slow, minor songs than low absorption; repetitive music is still predicted to remain the same regardless of absorption. However, it is also predicted that communion scores will be higher on both fast, major and slow, minor music than both high and low absorption scores on repetitive music. See Figure 9 for an example.

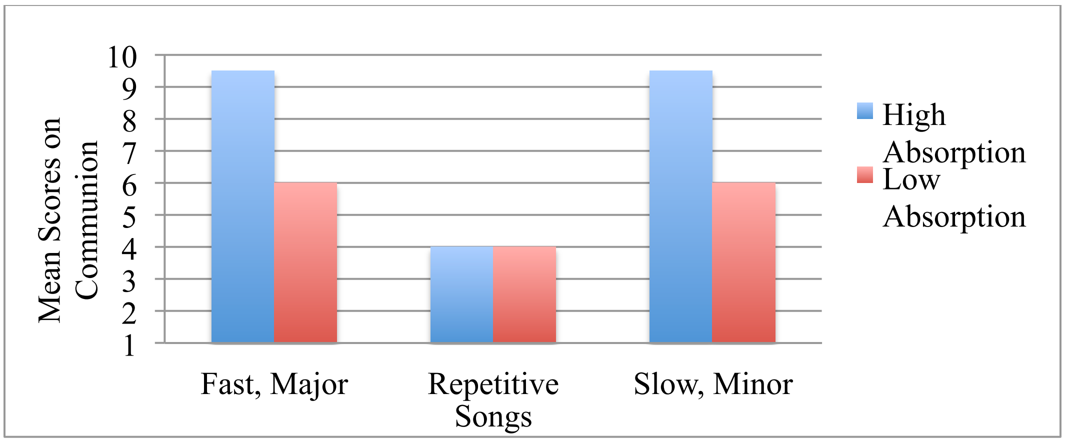

Figure 9. Song type and absorption interaction on communion following Levinson's alternative hypothesis. The figure shows the interaction between absorption and song type on communion scores when The Opponent-Process Theory is not followed.

CHAPTER III

METHOD

When asked in a survey what emotions they feel when listening to music, the respondents frequently mentioned feeling happiness, enjoyment, relaxed, calm, amusement, nostalgia, love, interest, and longing (Juslin, Liljeström, Laukka, Västfjäll, & Lungqvist, 2011), in addition to pleasant and unpleasant feelings (Hunter et al., 2008; Vieillard et al., 2008). People can easily detect happiness, sadness, anger, disgust, surprise, and fear in music with happiness and sadness as the easiest to classify (Mohn, Argstatter, & Wilker, 2010), but even if a piece of music is decidedly happy or sad, it may not evoke the intended emotions (Hunter et al., 2010). Because there are few experimental studies on why people like sad music (Vuoskoski et al., 2012), a pilot study was conducted to see if different songs would evoke the intended results in the participants from the participant pool.

Pilot Study

Participants

There were 21 volunteers for this experiment. The mean age was 19.25 with a range of 18-22. There were 19 females and 2 males, and 88% were European American. All participants were volunteers from a research pool at a midwestern university. For participating, they received partial credit for coursework. Participants were also asked to indicate which genre of music to which they listen the most. Thirty-three percent said that they liked country, and 19% reported liking alternative music. At 10% each, other responses included Pop, R & B, Rock, and Rap. Genres of Hip Hop and Religious were also 5% of the responses each. Responses varied, but no one said that they listen to classical music.

Materials

Songs. Debussy's *Prelude: Des pas sur la Neige*, which was previously used in Peretz, Gagnon, and Bouchard (1998), and *Adagio* by Albiono, which was previously used in Peretz et al. (1998), Khalfa et al. (2007), and Krumhansl (1997), were used as the slow, minor stimuli. John Adam's *Common Tones in Simple Time* from *Chairman Dances,* which was used in Clark (1983); Wenzlaf, Wegner, & Klein (1991); and Heatherton et al. (1998), was used as one of the repetitive stimuli. Moby's *Hymn*, which was previously used in Silvia and Abele (2002), was used as the second repetitive stimuli. Vivaldi's *Concerto (Sinfonia) in D Major*, which was previously used in Hunter et al. (2008), and the third movement from Mozart's *Concerto Number 23*, which was previously used in Peretz et al. (1998) and Khalfa et al. (2007), were used as the fast, major stimuli. All songs were played on a computer and were heard using a pair of Bose Noise-Canceling headphones.

All songs were edited to control for time, started at the beginning of the piece, and were stopped around the same time at logical phrase resolutions. Debussy's *Prelude: Des pas sur la Neige* lasted for 50 s; *Adagio* lasted for 67 s; *Common Tones in Simple Time* lasted 66 s; Moby's *Hymn* lasted for 50 s; *Concerto (Sinfonia) in D Major* lasted for 54 s, and the third movement of Mozart's *Concerto Number 23* lasted for 55 s. Also, audio-recorded directions were created in GarageBand. These recorded directions told the participants to stop the playlist, fill out the surveys, hand the surveys to the researcher, and then restart the playlist to listen to the next song. Between the songs and recordings were 3-s gaps of silence, and the songs crossfaded into the silence during the last second of play.

The Modified-Reysen Likability Scale. To measure liking, a modified version of The Reysen Likability Scale (Reysen, 2005) was used.

Emotion measurement. The measured emotions included happiness, sadness, anger, disgust, surprise, fear, pride, excitement, satisfaction, boredom, and relaxed. All participants rated each emotion on 5-point Likert scales ranging from *Not Felt at All* to *Extremely Intense Emotion.*

Design

This was a within-subjects design, because all participants listened to all six songs. The order of the songs was counterbalanced with four conditions, but the Adams song began each set list, and the Moby was always in between the fast, major and slow, minor songs to avoid emotional carry-over. Using a random number generator to generate eight sets of four numbers, one through four, a list of numbers was created to represent each of the four counterbalancing conditions. As participants volunteered, they were assigned to one of the conditions based on the list.

Procedure

Participants entered the lab, signed the informed consent form, and listened to all six songs in order of the collative properties: repetitive, then two fast, major songs, another repetitive, and two slow minor, songs, for example. After signing the informed consent, all participants put on the headphones and listened to each song. After each song, they were asked to rate how they felt based on the song and to take the modified

Reysen Likability Scale. Counterbalancing was done by switching the 2 fast, major and slow, minor songs and by switching the order of the slow, minor and fast, major songs. Therefore, the order of counterbalancing could also be repetitive, then 2 slow, minor songs, another repetitive song, and then 2 fast, major songs, while also changing which fast, major and slow, minor songs were presented first. Valences of 11 felt emotions were also measured.

Results

Several people indicated that they liked the fast, major (Vivaldi and Mozart) songs and the repetitive (Adams and Moby) songs. Using item 2 on the scale, which measured how much they liked the song, 7 participants said that they agreed to strongly agreed to liking the Adams song. Eleven participants said that they agreed to strongly agreed to liking the Vivaldi song. Nine participants said the same thing for the Mozart song. Ten participants indicated liking the Moby song. However, few people reported liking the slow, minor songs (Debussy and Albioni). Only 6 people liked the Debussy song, and 3 people liked the Albioni.

Do the songs evoke their intended emotions? Two one-way repeated-measures ANOVAs were run, one for happiness scores on all six songs and another for sadness scores. For happiness, Mauchly's test indicated that the assumption of sphericity was violated, $\chi^2(14) = 23.97$, $p = .048$; therefore, the degrees of freedom were corrected using Huynh-Feldt estimates of sphericity ($\varepsilon = .75$). Refer to Figure 10 for the means and standard errors. The results showed that there was a significant main effect for happiness scores by songs, $F(3.75, 74.94) = 30.39$, $p < .001$, $\eta^2 = .60$. Bonferroni comparisons revealed that the two fast, major songs evoked more happiness than all the other songs (*ps* $< .003$), except the Adams song ($p > .05$). The Moby song was significantly different between the fast, major and slow, minor songs (*ps* $< .05$) but was nonsignificantly different from the Adams song ($p = .22$). The slow, minor songs had the lowest happiness scores than the other songs (*ps* $< .05$) and were not statistically different from each other ($p = 1.00$).

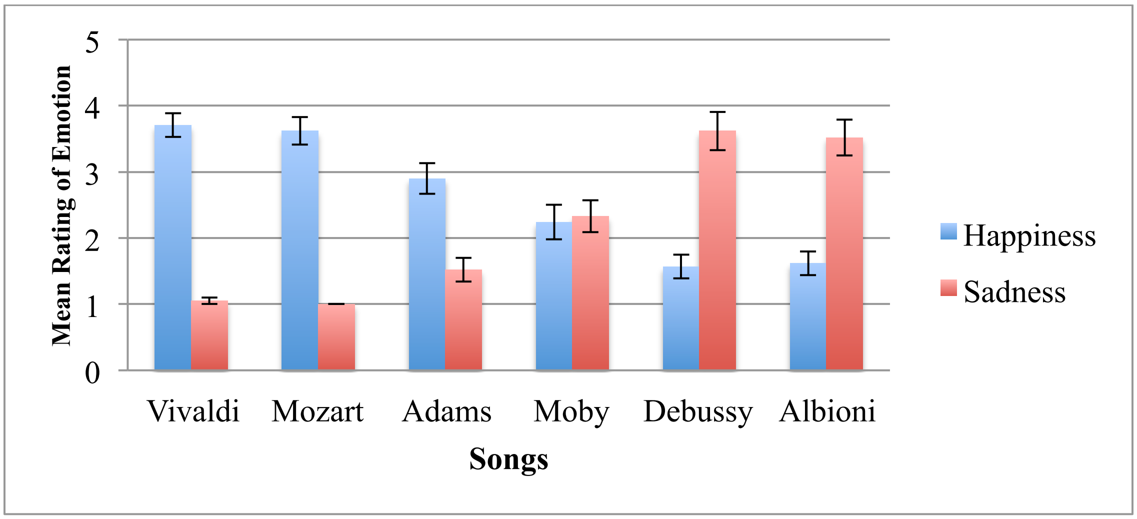

Figure 10. Happiness and sadness ratings per song. This figure shows that the two fast, major songs (Vivaldi and Mozart) had higher happiness scores than Moby (a repetitive song) and the two slow, minor songs (Debussy and Albioni). Happiness on Moby was also statistically significant from the two slow, minor songs. The two slow, minor songs, Debussy and Albioni, had the highest scores of sadness. The two fast, major songs, Vivaldi and Mozart, had the lowest scores. One repetitive song, Moby, was in the middle of both the happy and sad songs, but the other repetitive song, Adams, was only different from the slow, minor songs.

The one-way repeated-measures ANOVA for sadness indicated that the assumption for sphericity as determined by Mauchley's test was not met, $\chi^2(14) = 56.07$, $p < .001$; therefore, the degrees of freedom were corrected using Hyunh-Feldt estimates of sphericity ($\varepsilon = .84$). The results indicated a significant main effect for sadness scores by songs, $F(4.19, 83.69) = 46.29$, $p < .001$, $\eta^2 = .70$. Refer to Figure 10 for the means and standard errors. Bonferroni post-hoc comparisons revealed that the Moby song (a repetitive song) had higher sadness scores than the two fast, major songs, Vivaldi ($p < .001$) and Mozart ($p < .001$). Moby's sadness scores were also lower than the two slow, minor songs, Debussy ($p = .001$) and Albioni ($p = .001$). The two slow, minor songs were not statistically different from each other, $p = 1.00$, and the two fast, major songs, Vivaldi and Mozart, were not statistically significant from each other, $p = 1.00$. Although the two repetitive songs, Adams and Moby, were not statistically significant from each other, $p = 1.00$, the scores on sadness from the Adams song were only statistically different from the two slow, minor songs, Debussy ($p < .001$) and Albioni ($p < .001$).

One-way between-subjects ANOVAs were run between the four counterbalancing conditions for each song. Refer to Table 1 for a list of song order by set. For happiness scores, there was a significant main effect for the Moby song, $F(3, 17) = 7.70$, $p = .01$., $\eta^2 = .45$. Levene's test of homogeneity of variance was determined to be nonsignificant, $F(3, 17) = .54$, $p = .09$. Bonferroni post-hoc comparisons revealed that Set 1 ($M = 1.2$, $SD = .45$) had significantly lower scores than Set 3 ($M = 3.4$, $SD = 1.14$). All other comparisons including Set 2 ($M = 2.00$, $SD = 1.26$) and Set 4 ($M = 2.23$, $SD = .55$) were not significantly different, *ps* > .05. Likewise, one-way between-subjects ANOVAs were run between the four conditions for each song on sadness scores. Similar to the happiness scores, only the Moby song showed a significant main effect, $F(3, 17) = 6.38$, $p = .004$, $h^2 = .53$. Levene's test for homogeneity of variance was determined to be nonsignificant, $F(3, 17) = .34$, $p =.80$. Bonferroni post-hoc comparisons revealed that Set 1 (Mozart played before Moby; $M = 3.6$, $SD = .55$) had higher scores of sadness than Set 2 ($M = 2.00$, $SD = 1.10$), $p = .03$, and Set 4 ($M = 1.4$, $SD = .55$), $p = .004$. All other comparisons including those with Set 3 ($M = 2.4$, $SD = .89$) were nonsignificant, *ps* > .05. It appears that song order did have an effect on the Moby song by decreasing happiness scores and increasing sadness scores when the song was played after a fast, major song.

Table 1

Counterbalancing Conditions for each Set

Order	Set 1	Set 2	Set 3	Set 4
1	Adams	Adams	Adams	Adams
2	Vivaldi	Mozart	Prelude	Adagio
3	Mozart	Vivaldi	Adagio	Prelude
4	Moby	Moby	Moby	Moby
5	Prelude	Adagio	Vivaldi	Mozart
6	Adagio	Prelude	Mozart	Vivaldi

The other emotions were not analyzed statistically, but their means by song can be seen in Figure 11. It appears that the emotions felt most intently by the Adams song were happiness and relaxed. For the Vivaldi and the Mozart songs, happiness and excited were felt most intensely. Sadness and relaxed were evoked in the Debussy song, but sadness and fear were evoked in the Albioni song. Therefore, the fast, major and slow, minor songs evoked their intended emotions as well as other positive and negative emotions, respectively. Both of the repetitive songs did not induce scores in-between happiness and sadness, but the neutrality of the song may be a function of comparisons between songs.

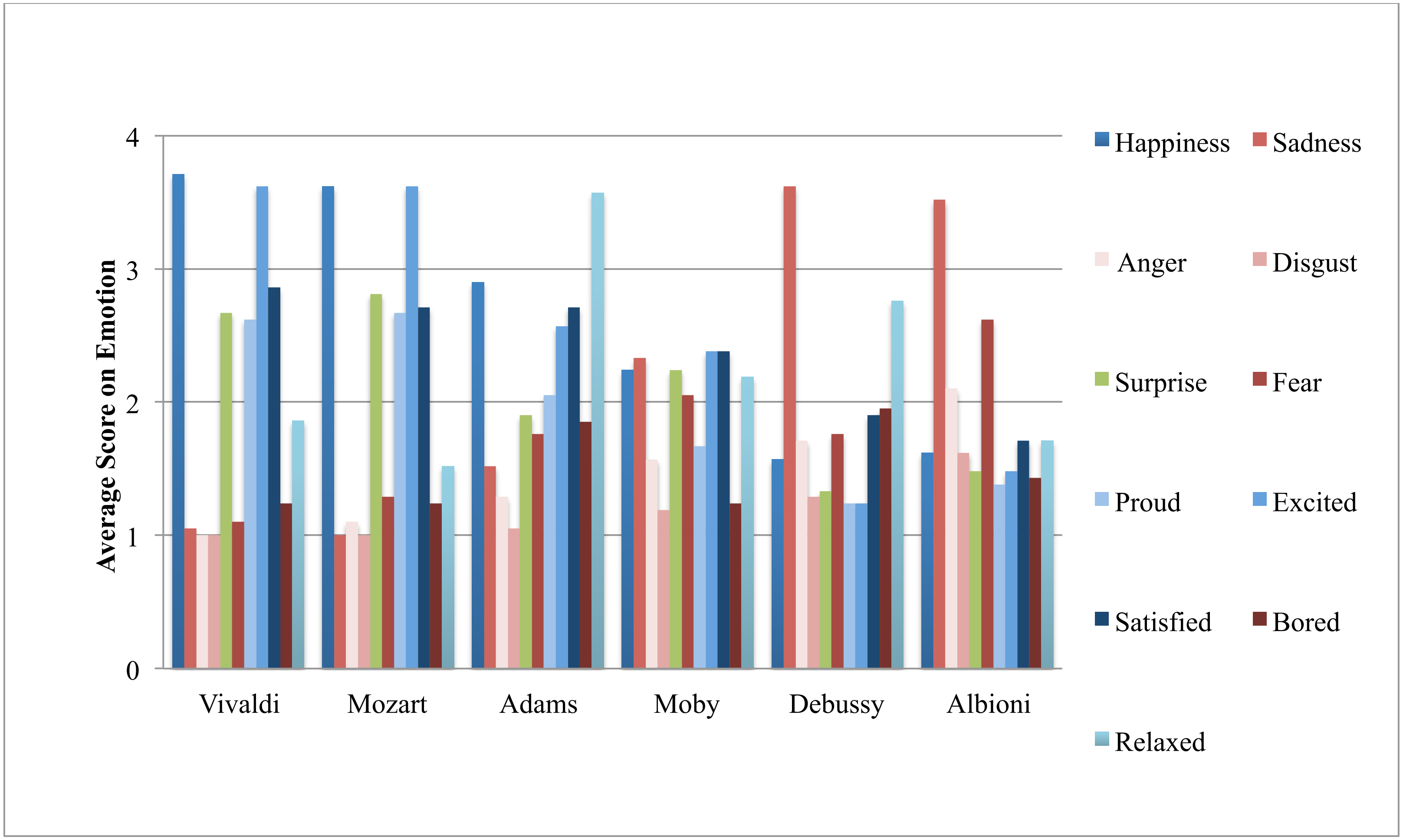

Figure 11. Average emotion rating by song. Average emotion rating by song. As seen in this figure, scores for boredom on the Adams song were highest. Scores for happiness and excited where the highest on the Vivaldi and Mozart songs. The scores for each emotion were similar on the Moby song. Finally, sadness scores were highest on the Debussy and Albioni songs, but the Debussy song also induced relaxation while the Albioni song induced fear.

Are slow, minor or fast, major songs liked more than repetitive songs? For the Modified-Reysen Likability Scale, Cronbach's alphas were analyzed for each song. All alphas were above .90 except for the Albioni song, which was .89. Two items, questions 3 and 5, were determined to be reducing the overall alpha value and were deleted to increase internal consistency and make the test more reliable across the songs. Once the items were removed, the alphas for all six songs either stayed the same or increased, and all alphas were above .90. Table 2 shows the alphas with and without the deleted items.

Table 2

Cronbach's Alphas by Song

	Cronbach's Alphas	
Songs	No Items Deleted	Items 3 and 5 Deleted
Adams	0.94	0.94
Vivaldi	0.92	0.93
Mozart	0.92	0.92
Moby	0.91	0.93
Debussy	0.90	0.91
Albioni	0.89	0.91

Composite scores of liking the songs were created by adding all of the items, except for questions 3 and 5, together and dividing by 10. The scores for each song were analyzed with a one-way repeated-measures ANOVA. Mauchley's test for sphericity indicated that the assumption for sphericity was not violated, $\chi^2(14) = 22.49$, $p = .70$. Refer to Figure 12 for the means and standard errors. The results indicated that there was a significant main effect, $F(5, 100) = 3.54$, $p = .005$, $\eta^2 = .73$. Bonferroni comparisons showed only that the Albioni song was liked significantly less than the two happy songs, *ps* = .03. Therefore, it seems plausible that slow, minor songs are liked less, but the effect may be a function on other collative properties of the song. It appears that this effect is determined by other collative properties of the music than tempo and modality.

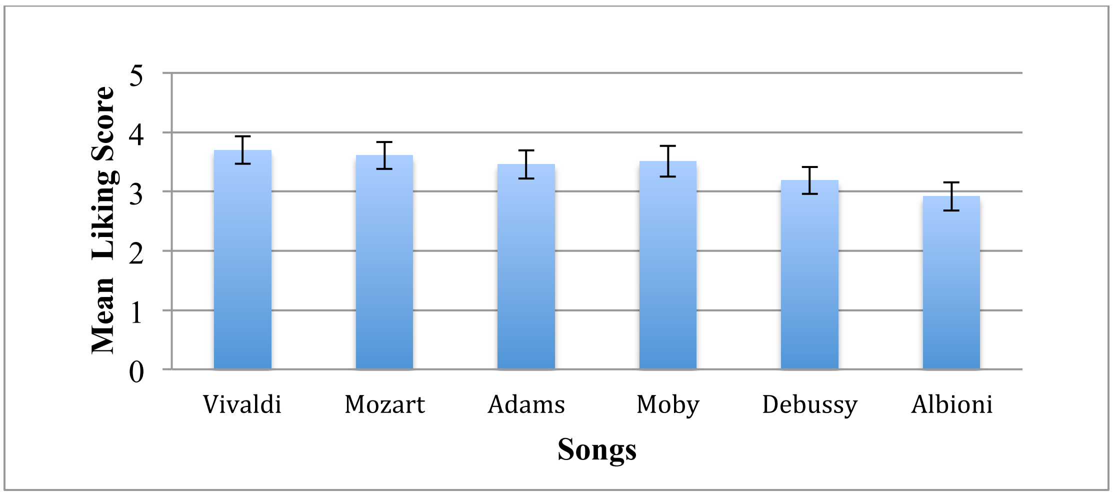

Figure 12. Composite liking score. This figure shows the amount of overall liking as developed from the Modified-Reysen Likability Scale. The Albioni song was liked significantly less than the Vivaldi and Mozart songs.

Is there a relationship between strength of felt emotion and liking, and does satisfaction play a role in obtaining nonmusical outcomes? Correlations were run between happiness, sadness, satisfaction, and liking for each song. Correlations were averaged by the collative properties of the music. So, scores from slow, minor songs were averaged together. The same procedure occurred for fast songs with a major modality and for repetitive songs. If the correlations were significant in both songs, then they were only considered significant in the averaged correlation.

For the slow, minor songs and the repetitive songs, significant correlations were only found between feeling satisfied and liking the songs. See Tables 3 and 4 for correlations.

Table 3

Averaged Correlations for Slow, Minor Songs

	Happy	Sad	Satisfied	Liking
Happy	1			
Sad	-0.2	1		
Satisfied	0.49	-0.38	1	
Liking	0.54	-0.16	0.58*	1

Note: * indicates significance when both songs were significant

Table 4

Averaged Correlations for Repetitive Songs

	Happy	Sad	Satisfied	Liking
Happy	1			
Sad	-0.4	1		
Satisfied	0.52	-0.25	1	
Liking	0.45	-0.26	0.7*	1

Note: * indicates significance when both songs were significant

For fast, major songs, happiness was significantly, positively correlated with feeling satisfied and with liking the songs. Feeling satisfied was also significantly, positively correlated with liking the songs. See Table 5 for the correlations.

Table 5

Averaged Correlations for Fast, Major Songs

	Happy	Sad	Satisfied	Liking
Happy	1			
Sad	-.19[a]	1		
Satisfied	.71*	-.38[a]	1	
Liking	.56*	-.33[a]	.63*	1

Note: [a] indicates correlation from the Vivaldi song only, because the Mozart sadness scores showed no variance.
* indicates significance when both songs were significant

These correlations indicate that feeling satisfaction is important for liking a song. As in the case for happiness in the fast, major songs, they also show that when satisfaction and emotion are correlated, the emotion is also correlated with liking.

Primary Study

Participants

This study utilized the participant pool in the Psychology Department at Illinois State University. A power analysis revealed that a small effect would need a sample size of 266 participants to achieve a power of .8. A medium effect would need 44 participants, but a large effect would only need 20 participants. This study obtained 85 participants.

No restrictions were made other than requiring all participants to be at least 18. See Appendix B for the list of demographic questions.

The average age of the participants was 20.07 (*SD* = 2.34) and ranged from 18 to 33. There were 72 females and 13 males, and the vast majority of participants (79%) were Caucasian. Other ethnicities included African-American (9%), Asian (5%), Hispanic (6%), and Mixed (1%). The participants were almost evenly divided between being a freshman (18%), sophomore (34%), junior (28%), or senior (20%). Finally, only 14 participants described themselves as being a musician, and when asked how much musical training they had, most people said either *A Little* or *Some* (*M* = 2.42, *SD* = 1.05). When asked how important music is to them, most people said either *A Fair Amount* or *A lot* (*M* = 4.11, *SD* = .82). Finally, when asked how familiar they were with the songs they heard, the participants indicated that they were largely unfamiliar with the songs. Using a scale of 0 (*I was not familiar with this song prior to the experiment*) to 5 (*I was very familiar with this song*), the mean and standard deviation were 1.61and 1.60 for Vivaldi, .36 and .91 for Moby, and .29 and .69 for Debussy.

Materials

Music preference. To measure liking of a song, the current study used the Preference subscale from Schäfer and Sedlmeier (2010). This subscale is a 6-item scale with items on a 1 to 10 Likert type scale of *I do not agree at all* to *I totally agree*. Internal reliability was high for the scores from this scale: .96 for a lab setting and .94 for an online survey setting (Schäfer & Sedlmeier, 2010). The Modified-Reysen Likability scale from the pilot was not used, because it failed to reach the internal validity of the Schäfer and Sedlmeier preference subscale. For the current student, the scores from Preference

Subscale had a Cronbach's alpha of .89 for the Vivaldi, .88 for the Moby, and .90 for the Debussy.

Absorption. This study used the Sandstrom and Russo (2011) Absorption in Music Scale (AIMS). It is a 34-item scale with each item measured on a 5-point Likert scale of *Strongly Disagree* to *Strongly Agree*, and it was designed specifically to measure one's ability to absorb oneself into music. Cronbach's Alpha ranges from .92 to .94; test-retest reliability showed a strong, positive correlation (r = .91); and, test-retest correlations ranged in time from 29 days to 78 days with an average time difference of 50.3 days. This scale correlates strongly with the Tellegen Absorption Scale (r = .76; Sandstrom & Russo, 2011). For the current study, the AIMS had a Cronbach's alpha of .91.

Communion. Because music is a nondiscursive form of communication that communicates emotionally through redundant patterns (Gfeller, 2005), the Communication subscale from Schäfer and Sedlmeier (2010) was used to measure the nonmusical outcome of communion. This is a 7-item subscale with a 1 to 10 Likert type rating of *I do not agree at all* to *I totally agree.* Internal reliability was high with a .94 Cronbach's alpha in both a lab and an online survey setting (Schäfer & Sedlmeier, 2010). For the current study, scores from the Communication Subscale had a Cronbach's alpha of .95 for the Vivaldi, ,95 for the Moby, and .94 for the Debussy.

Emotions and other measures. Happiness, sadness, satisfaction, and engagement were measured individually on 5-point Likert-type scales. Familiarity was also measured using Ilie and Thompson's (2011) scale of 0 (*I was not familiar with it prior to this* *experiment*) to 5 (*I was very familiar with it prior to this experiment*). See Appendix A for the measures.

Songs. For classical music, the fast, major song was Vivaldi's *Concerto (Sinfonia) in D Major*, and the slow, minor song was Debussy's ` control for time, and stopped at logical phrase conclusions. Vivaldi's *Concerto (Sinfonia) in D Major* was heard for the first 53.5 s; Debussy's Prelude: *Des pas sur la Neige* was heard for the first 50 s; and, Moby's *Hymn* was heard for the first 50 s. All songs faded into silence starting at 3 s of the clip.

Instruments. All participants answered all questions on a computer and heard all songs played from a computer. Bose noise-cancelling headphones were used to disseminate the music from the computer to the participants.

Design

This experiment compared fast, major versus slow, minor versus repetitive music. Because listening to music is a highly individualized experience, a within-subjects design was used. Within-subjects designs show a comparative effect where listening to a fast, major song first causes slow, minor songs to evoke more sadness and vice versa (Mitterschiffthaler, Fu, Dalton, & Williams, 2007; as well as the pilot), so the current experiment used a Latin square design to counterbalance the songs. See Table 6 for the counterbalanced order sets. The AIMS was intended as a moderator but was administered before the music in half the participants and after the music in the other half of the participants.

Participants were randomly assigned to each counterbalancing condition. As there were 12 separate conditions between the 6 counterbalanced conditions, each with 2 conditions for the AIMS, a random number generator was created with numbers between 1 and 12. As participants signed up to participate from the research pool, they were assigned to the randomly generated order of conditions.

Table 6

Counterbalanced Order Sets for the Primary Study

Order	Set 1	Set 2	Set 3	Set 4	Set 5	Set 6
1	Vivaldi	Vivaldi	Moby	Moby	Debussy	Debussy
2	Moby	Debussy	Vivaldi	Debussy	Vivaldi	Moby
3	Debussy	Moby	Debussy	Vivaldi	Moby	Vivaldi

Procedure

Participants entered the lab, and once they signed the informed consent, they answered the demographic items. At this point, half of the participants responded to the AIMS. Then, the participants listened to all three songs according to the set order in Table 6. After each song, they answered the preference and communication subscales, and they rated how much they felt happiness, sadness, and satisfaction during the song. The other half of the participants who had not yet filled out the AIMS then responded to the items on the test. Once the participants finished listening to the songs and answering all of the dependent variables, they were assessed for emotional distress and debriefed.

CHAPTER IV

RESULTS

This section of the thesis is to show the statistical analyses to test the hypotheses. As regression was proposed for most of these hypotheses, assumptions of regression were tested. The assumptions tested were these: regression line is linear, residuals show homoscedasticity; and the residuals are normally distributed. Preliminary analyses were run to determine if the results from the pilot held over to a larger sample.

Analyses

Preliminary Analyses

Descriptive statistics. Means and standard deviations are displayed in two different tables. Table 7 shows the means and standard deviations for happiness, sadness, and satisfaction per song. Table 8 shows the means and standard deviations of total communication and preference for each song, and total satisfaction. For absorption, the mean was 120.76, and the standard deviation was 16.39.

Table 7

Means and Standard Deviations per Song

	Happiness	Sadness	Satisfaction
Songs	*M*(*SD*)	*M*(*SD*)	*M*(*SD*)
Vivaldi	3.55(.89)	1.02(.15)	3.24(,92)
Moby	2.76(.85)	1.80(.96)	3.02(.98)
Debussy	1.44(.70)	3.29(.95)	2.09(1.05)

Table 8

Means and Standard Deviations

	Constructs	
	Liking	Communication
Songs	*M*(*SD*)	*M*(*SD*)
Vivaldi	3.18(1.75)	3.42(2.08)
Moby	2.91(1.63)	3.09(1.89)
Debussy	2.63(1.70)	3.34(2.03)

Correlations. Communication with the Debussy song was correlated with the communication scores from the Moby and Vivaldi songs. Communication with the Debussy song was also correlated with liking the Debussy, the Moby, and the Vivaldi songs. As liking a song increased, so did having a communication with it. This effect was strong in all three songs. See Table 9 for the full correlation matrix.

Table 9

Correlation Coefficients for All Measured Variables

	Absorption	Vivaldi Happiness	Vivaldi Sadness	Vivaldi Satisfied	Vivaldi Liking	Vivaldi Communication	Moby Happiness
Absorption	1						
Vivaldi Happiness	.29**	1					
Vivaldi Sadness	-.03	.08	1				
Vivaldi Satisfaction	.26*	.69**	.05	1			
Vivaldi Liking	.35**	.52**	.06	.54**	1		
Vivaldi Communication	.35**	.55*	.10	.64**	.81**	1	
Moby Happiness	.07	.24*	.13	.31**	.28*	.26**	1
Moby Sadness	.14	.07	.11	.15	.09	.07	-.17
Moby Satisfied	.19	.42**	.08	.52**	.25*	.31**	.48**
Moby Liking	.34**	.32**	.17	.36**	.57**	.50**	.36**
Moby Communication	.32**	.27*	.22*	.42**	.48**	.59**	.40**
Debussy Happiness	.22	.05	.14	.15	.34**	.23*	.05
Debussy Sadness	.00	.27	.03	.29**	.13	.16	.13
Debussy Satisfied	.17	.30*	.06	.31**	.35**	.39**	-.17
Debussy Liking	.29**	.27	.04	.32**	.63**	.59**	.05
Debussy Communication	.38**	.22*	-.02	.36**	.51**	.66**	.15

Note: * $p < .05$, **** $p < .01$**

Table 9

Continued Correlation Coefficients for All Measured Variables

	Moby Sadness	Moby Satisfied	Moby Liking	Moby Communication	Debussy Happiness	Debussy Sadness	Debussy Satisfied	Debussy Liking
Absorption								
Vivaldi Happiness								
Vivaldi Sadness								
Vivaldi Satisfaction								
Vivaldi Liking								
Vivaldi Communication								
Moby Happiness								
Moby Sadness	1							
Moby Satisfied	-.08	1						
Moby Liking	.03	.34**	1					
Moby Communication	.10	.36**	.80**	1				
Debussy Happiness	.18	.07	.16	.18	1			
Debussy Sadness	.17	.28*	.19	.18	-.43**	1		
Debussy Satisfied	.30	.29**	.08	.08	.43**	.00	1	
Debussy Liking	.24	.16	.61**	.52	.38	.05	.52**	1
Debussy Communication	.17	.25**	.61**	.74	.24	.17	.33**	.75**

Note: * $p < .05$, ** $p < .01$

Manipulation checks.

Do the songs evoke their intended emotions? A 3 (Songs: Vivaldi, Moby, and Debussy) x 2 (Emotions: Happiness and Sadness) repeated measures ANOVA was run. See Table 7 for the means and standard deviations. Mauchly's test of sphericity was not violated for the main effect of song (χ^2[2]= 4.47, p = .11) but was violated for the interaction between the emotions and songs, $\chi^2(2) = 6.27$, $p = .04$. There was not a significant difference in emotion between the songs (Wilk's $\Lambda = .97$, F[2, 83] = 1.29, p = .28, $\eta^2 = .03$), but the participants felt happiness during the songs much more strongly than they felt sadness, Wilk's $\Lambda = .62$, $F(1, 84) = 50.82$, $p < .001$, $\eta^2 = .86$. The interaction between the felt emotions and the songs was also significant with the Huynh-Feldt, corrected degrees of freedom ($\varepsilon = .95$), $F(1.90, 220.70) = 262.43$, $p < .001$, η^2 = .76. Post-hoc analyses revealed that the Vivaldi song had higher happiness scores than the Moby and Debussy songs, and that the Moby song had lower happiness scores than the Vivaldi song but higher than the Debussy song. They also revealed that the Debussy song had higher sadness scores than Moby and Vivaldi songs, and that the Moby songs had lower sadness scores than the Debussy song and higher sadness scores than the Vivaldi songs. All post-hoc differences had significance values of less than .001.

In other words, the songs evoked their intended emotions. Even though Moby seems to have evoked more happiness than sadness, these emotions were still in between the Vivaldi and the Debussy's emotions. See Figure 13 for a visual representation.

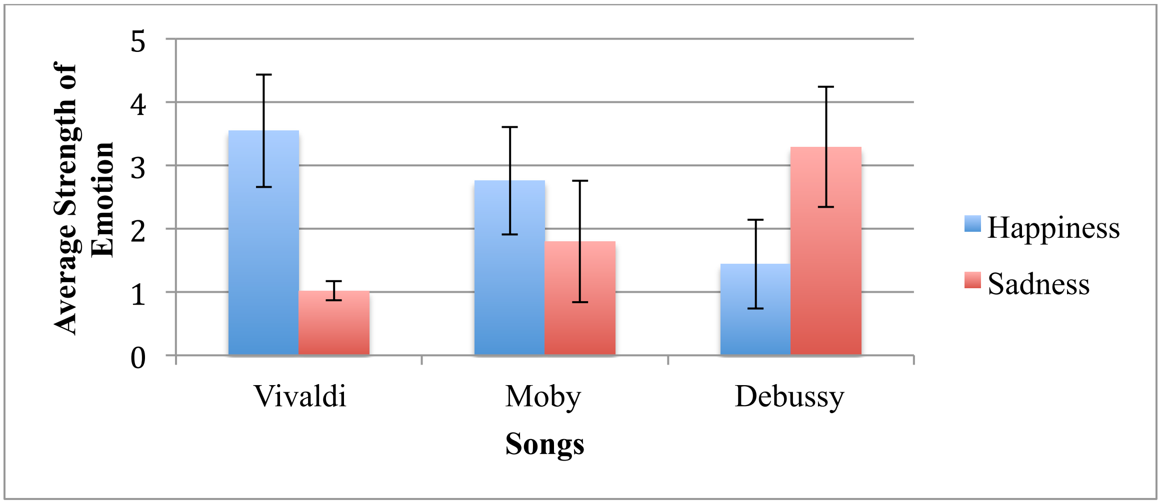

Figure 13. Felt emotions. The participants felt stronger happiness in the Moby song than the Debussy song but less happiness than the Vivaldi song. Participants also felt more sadness in the Moby than the Vivaldi but less sadness in the Debussy.

Counterbalancing effects. To see if there were any counterbalancing effects, twelve, 2 (AIMS Placement: Before Music versus After Music) x 6 (Set Condition) ANOVAs were run on happiness and sadness ratings from each song, liking of each song, and having a communication with each song.. A significant difference was found between the 6 sets when rating how happy they felt when listening to Moby, $F(5, 73) = 2.63$, $p = .03$, $\eta^2 = .15$. Post-hoc comparisons using Bonferroni did not reveal any significant differences. A statistically significant difference was also found between the 6 sets on feeling happiness from the Vivaldi song, $F(5, 73) = 5.23$, $p < .001$, $\eta^2 = .26$. Bonferroni post-hoc comparisons revealed Set 1 had lower happiness scores than Set 4 ($p = .02$), Set 5 ($p = .005$) and Set 6 ($p = .02$). Set 2 also had lower happiness scores then Set 5 ($p = .02$). These results suggested that people were happier after the Moby and Vivaldi songs when those songs came after the Debussy song. All other main effects and interactions were nonsignificant, *ps* > .05.

To determine if absorption changed after listening to the songs, a between samples t-test was run on the before and after AIMS scores. Participants declared they had significantly higher absorption ratings after listening to the songs (M = 124.60, SD = 17.85) than those who rated their absorption before the songs (M = 117.02, SD = 14.06), $t(83) = -2.18$, p =.03. Absorption did not significantly change, however, depending on the set condition, using only the AIMS scores after they heard the songs, $F(5, 36) = 2.41$, p = .056. Set 1 (M = 117.43, SD = 22.38), Set 2 (M = 119.29, SD = 14.06), Set 3 (M = 118.00, SD = 15.73), Set 4 (M = 123.29, SD = 15.81), Set 5 (M = 143.00, SD = 16.95), and Set 6 (M = 124.60, SD = 17.85) were statistically the same.

Primary Analyses

Does slow, minor music create a communion with the song? A repeated measures ANOVA on run on the scores from the Communication Subscale scores from each song. Mauchly's test of sphericity was not violated, $\chi^2(2) = 5.72$, $p > .05$. A statistically significant difference between the three songs was not found even though the means for both the Vivaldi and Debussy song were higher than the Moby, Wilk's Λ = .96, $F(2, 83) = 1.74$, $p = .18$, $\eta^2 = .04$. See Table 7 for the means and standard deviations and Figure 14 for a visual representation.

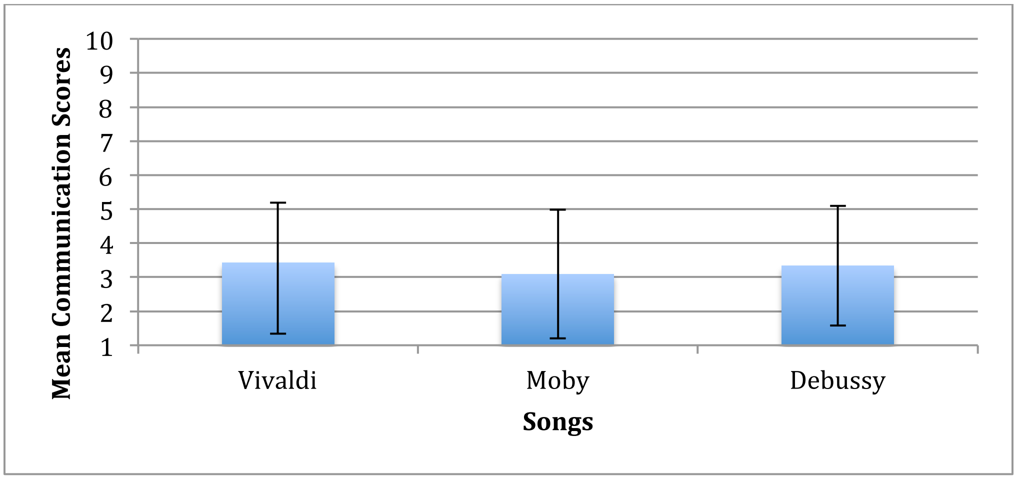

Figure 14. Mean communication scores. All songs created about the same communication scores.

The communication scores were converted to z-scores to look for outliers. A frequency distribution of these z-scores revealed no outliers. The distributions for Vivaldi (skewness = .77, *SD* = .26), Moby (skewness = 1.03, *SD* = .26), and Debussy (skewneess =.75, *SD* = .26) were positively skewed. Transformations for all three songs were performed until the skewness value divided by its standard deviation was below 2.0. Natural log transformations for Vivaldi (skewness = -.04, *SD* = .26), Debussy (skewness = .02, *SD* = .26) and Moby (skewness = .08, *SD* = .26) were used to correct the positive skew. Even after running a repeated measures ANOVA on the corrected communication values per song, significant differences were not found (Wilk's $\Lambda = .96$, $F[2, 83] = 1.56$, $p = .22$, $\eta^2 = .04$) between the Vivaldi (*M* = 1.04, *SD* = .64), Moby (*M* = .95, *SD* = .60), and Debussy (*M* = 1.01, *SD* = .63).

It appears that slow, minor music did not create a communion with the song compared to the repetitive song. These results did not support Levinson's (1997) alternative hypothesis that fast, major and slow minor songs create a communion compared to other music. They also do not support the Opponent-Process Theory

(Solomon, 1980) hypothesis that fast, major music would have less communion than the repetitive, and that the slow, minor music would have more communion than the repetitive.

Do happiness and sadness mediate music's effect of creating communion? Following Judd, Kenny, and McClelland's (2001) guidelines for mediation in a within-subjects design, difference scores of happiness between the songs and the sums of these scores, difference scores of sadness and the sums of these scores, and differences of communication scores between the songs were created. Two linear regression analyses were run, one for happiness and communication and another for sadness and communication.

In the first analysis, happiness in Vivaldi was subtracted by the happiness (M = .79, SD = 1.08) in Moby. This difference in happiness predicted the difference between communication in Vivaldi and Moby (M = .32, SD = 1.80). This difference tested happiness's mediating effect, but the summed score (M = 0.00, SD = 1.37), which was centered, tested the moderation. The difference in happiness significantly predicted the difference in communication, $\beta = .38$, $t(82) = 3.83$, $p < .001$, VIF = 1.00. The sum of the scores did not significantly predict the communication scores, $\beta = .14$, $t(82) =$ .1.39, p = .17, VIF = 1.00. They explained a significant portion of the variance, $R^2 = .15$, $F(2, 82) = 8.55$, $p < .001$.

The standardized residuals were used to test normality and outliers. These residuals (skewness = -.46, SD = .26) were normally distributed. There appeared to be 3 outliers. See Figure 15 for the histogram. Even after removing these outliers, the difference in happiness still predicted communication ($\beta = .42$, $t[79] = 4.16$, $p < .001$), but the summed happiness scores did not, β = .06, $t(79) = .64$, $p = .52$. They still explained a significant portion of the variance, $R^2 = .18$, $F(2, 79) = 8.97$, $p < .001$. See Figure 16 for the scatterplot of the standardized residuals and predicted values. Figure 16 suggests that the data were linear and that they were heteroscedastic.

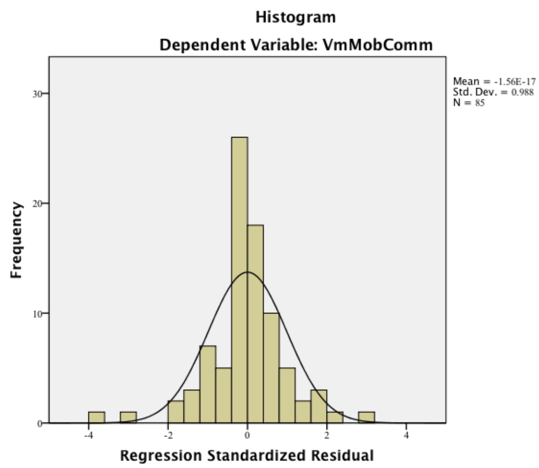

Figure 15. Histogram of standardized residuals for the difference in happiness predicting the difference in communication. This figure shows that the residuals were normally distributed, but there were 3 outliers.

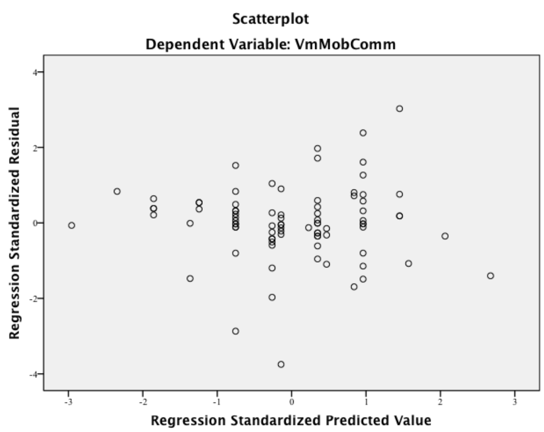

Figure 16. Scatterplot of standardized residuals in the difference in happiness scores and standardized residuals on the difference in communication. This plot shows that the data were linear and heteroscedastic.

For the second analysis, sadness in Debussy was subtracted by sadness in Moby ($M = 1.49$, $SD = 1.23$), and the sum of the two scores was always created ($M = 0.00$, $SD = 1.46$) and centered. The difference and the sum were used to predict the difference in communication between Debussy and Moby ($M = .24$, $SD = 1.49$). The difference in sadness did not significantly predict communication, β = -.09, $t(82) = -.83$, $p = .41$, VIF = 1.00. The summed scores also did not predict communication, β = .07, $t(82) = .62$, $p = .54$, VIF = 1.00. They did not explain a significant portion of the variance, either, $R^2 = .01$, $F(2, 82) = .54$, $p = .59$.

Figure 17 shows the histogram of the residuals to test the assumption of normality and to identify any outliers. These residuals were not skewed (skewness = .18, *SD* = .26), but there appeared to be 3 outliers. Removing the outliers did not affect the results. The difference in sadness still was not a significant predictor of communication, (β = -.07, $t[79] = -.62$, $p = .54$, VIF = 1.00), and neither did the sum of the sadness scores, β = .12, $t(79) = .1.07$, $p = .29$, VIF = 1.00. They did not explain a significant portion of the variance, $R^2 = .02$, $F(2, 79) = .76$, $p = .47$. Figure 18 shows the scatterplot of the sadness and the standardized residuals on communication. This figure shows that the data were linear and did not fail the assumption of homoscedasticity.

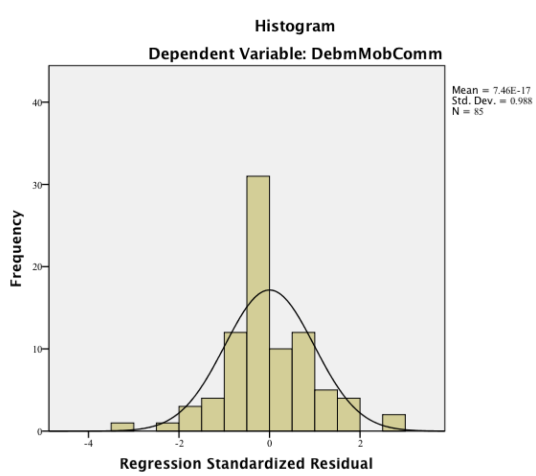

Figure 17. Histogram of standardized residuals for the difference in sadness predicting the difference in communication. This figure shows that the residuals were normally distributed, but there 3 were outliers.

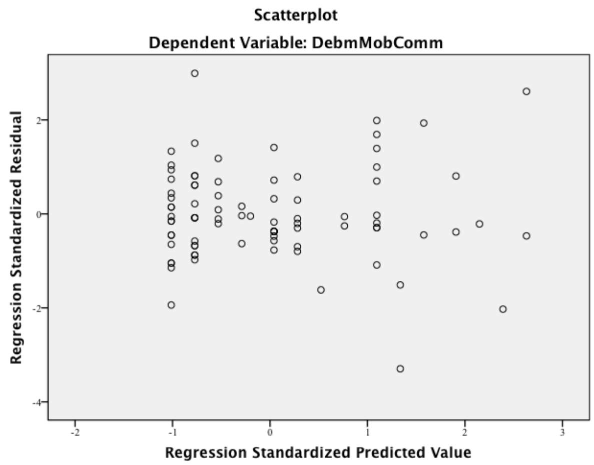

Figure 18. Scatterplot of standardized difference in sadness scores and standardized residuals on the difference in communication. This plot shows that the data were linear and homoscedastic.

Therefore, it appears that happiness is a mediator in creating a communion with a song. These data suggest that Levinson (1997) was not correct in theorizing that sadness would create a communion from a slow, minor song.

Does satisfaction moderate evoked happiness's and sadness's effect on liking a song? To test this research question, two linear regressions were run. In the first regression, the difference in happiness scores between Vivaldi and Moby (M = .00, SD = 1.08) was used to predict the difference in liking between Vivaldi and Moby (M = .27, SD = 1.57) with the difference in satisfaction scores (M = .00, SD = .93) as a moderator. Both happiness and satisfaction were centered after computing the difference scores. In step 1, the centered difference in satisfaction scores and the difference in happiness scores were entered. Happiness did not significantly predict liking (β = .16, t[82] = 1.45, p = .15, VIF = 1.14), but satisfaction did, β = .25, t(82) = 2.26, p = .03, VIF = 1.14. These explained a significant portion of the variance, R^2 = .12, F(2, 82) = 5.46, p = .006. The interaction (M = .35, SD = 1.47) between happiness and satisfaction was entered in step 2 but did not significantly predict liking, β = .16, t(81) = 1.17, p = .25, VIF = 1.67. It did not explain a significant portion of the change in variance, $\Delta R^2 = .02$, $F(1, 81) = 1.36$, $p = .25$.

Tests of linearity, homoscedasticity, and skewed data were also analyzed. Figure 19 shows the histogram of the residuals to test the assumption of normality and to identify any outliers. Even though the residuals were not skewed (skewness = .10, *SD* = .26), there was one outlier. Removing the outlier did not affect the results. Happiness still was not a significant predictor of communication, ($\beta = -.14$, $t[81] = 1.22$, $p = .22$), but satisfaction was, $\beta = .25$, $t(81) = 2.21$, $p = .03$. They explained a significant portion of the variance, $R^2 = .10$, $F(2, 81) = 4.68$, $p = .01$. The interaction was not a significant predictor of liking, either ($\beta = .11$, $t\,[80] = .98$, $p = .33$) and did not explain a significant amount of the change in variance, $\Delta R^2 = .01$, $F(1, 80) = .96$, $p = .33$. Figure 20 is the scatterplot of the standardized residuals and shows that the data were linear and were not heteroscedastic.

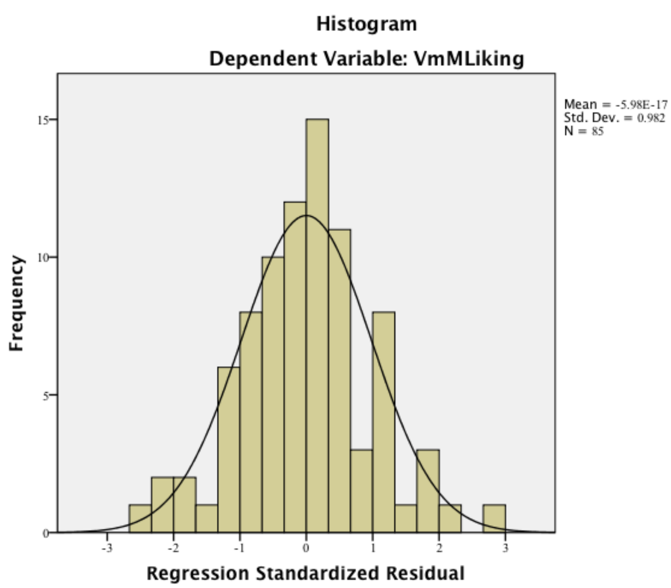

Figure 19. Histogram of standardized residuals for the difference in happiness and satisfaction predicting the difference in liking. This figure shows that the residuals were normally distributed but there was one outlier.

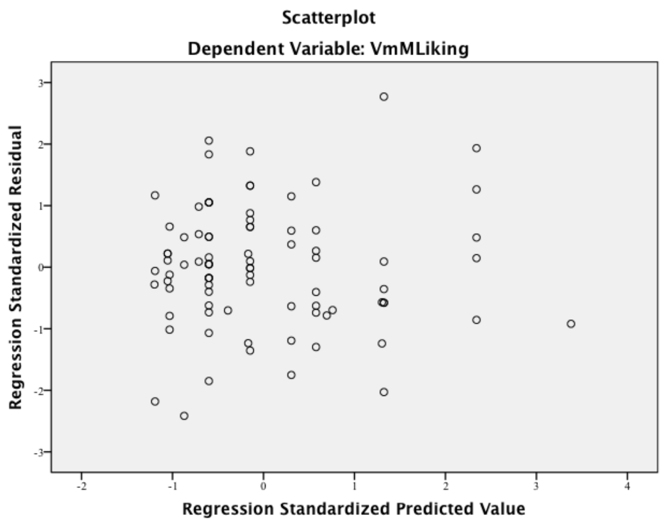

Figure 20. Scatterplot of standardized difference in happiness and satisfaction scores and standardized residuals on the difference in liking. This plot shows that the data were linear and homoscedastic.

In the second linear regression analysis, the difference in sadness scores between Debussy and Moby (M = .00, SD = 1.23) was used to predict the difference in liking scores between Debussy and Moby (M = -.28, SD = 1.47) with the difference in satisfaction (M = .00, SD = 1.21) as a moderator. Satisfaction and sadness were centered. Sadness and satisfaction were entered in step 1. Satisfaction predicted liking (β = .58, t[82] = 5.96, p < .001, VIF = .82), but sadness did not, β = -.07, t(82) = -.68, p = .50, VIF = .82. They did explain a significant portion of the variance, R^2 = .37, F(2, 82) = 24.24, p < .001. The interaction between sadness and satisfaction (M = -.63, SD = 1.79) was entered in step 2, but it did not significantly predict liking, β = -.17, t(81) = -1.97, p = .05, VIF = 1.01. It also did not explain a significant amount of the change in the variance, ΔR^2 = .03, F(1, 81) = 3.89, p = .05.

Figure 21 shows that the data were linear and did not fail the assumption of homoscedasticity. Figure 22 shows the histogram of the residuals to test the assumption of normality and to identify any outliers. These residuals were not skewed (skewness =

.34, *SD* = .26), but there appeared to be three outliers.

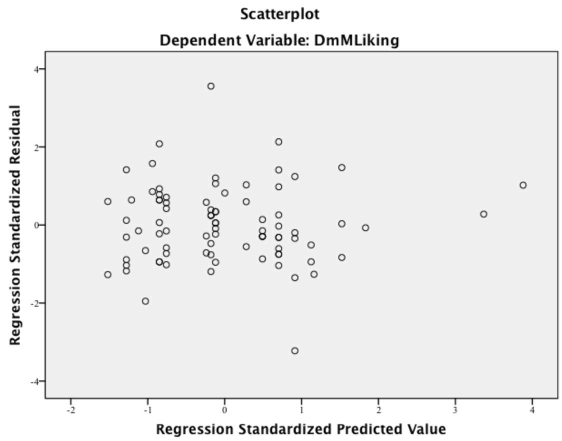

Figure 21. Scatterplot of standardized difference in sadness and satisfaction scores and standardized residuals on the difference in liking. This plot shows that the data were linear and homoscedastic.

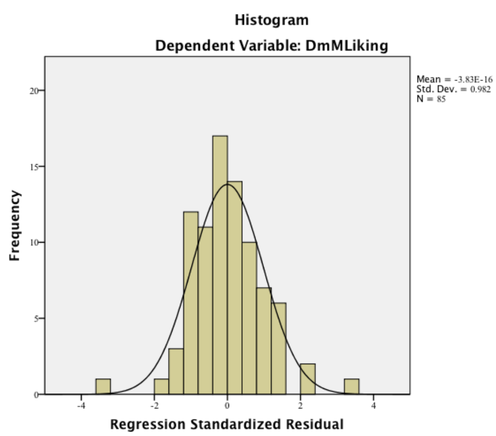

Figure 22. Histogram of standardized residuals for the difference in sadness and satisfaction predicting the difference in liking. This figure shows that the residuals were normally distributed but there were three outliers.

Once the 4 outliers were identified based on the standardized residuals, they were removed, and the data were reanalyzed. In step 1, sadness (*M* = .00, *SD* = 1.25) still did not predict liking (*M* = -.36, *SD* = 1.34, β = -.12, *t*[78] = -1.42, *p* = .16, VIF = .82), but satisfaction (*M* = .00, *SD* = 1.23) did, β = .65, *t*(78) = 7.37, *p* < .001, VIF = .82. They significantly explained about half of the variance, R^2 = .50, *F*(2, 78) = 39.61, *p* < .001. In step 2, the interaction between sadness and satisfaction (M = -.64, SD = 1.83) was significant without the outliers, β = -.22, t(77) = -2.83, p = .006, VIF = 1.01. It also significantly explained the change in variance, ΔR^2 = .05, F(1, 77) = 8.00, p = .006. Using MODPROBE by Hayes and Matthes (2009), a further analysis was run to obtain the conditional slopes. Low satisfaction (β = .08, t[77] = .64, p = .52) and average satisfaction (β = -.12, t[77] = -1.33, p = .19) did not influence sadness's effect of liking. High satisfaction, however, did have a significant effect, β = -.32, t(77) = -2.84, p = .006. See Figure 23 for a visual representation of the moderation.

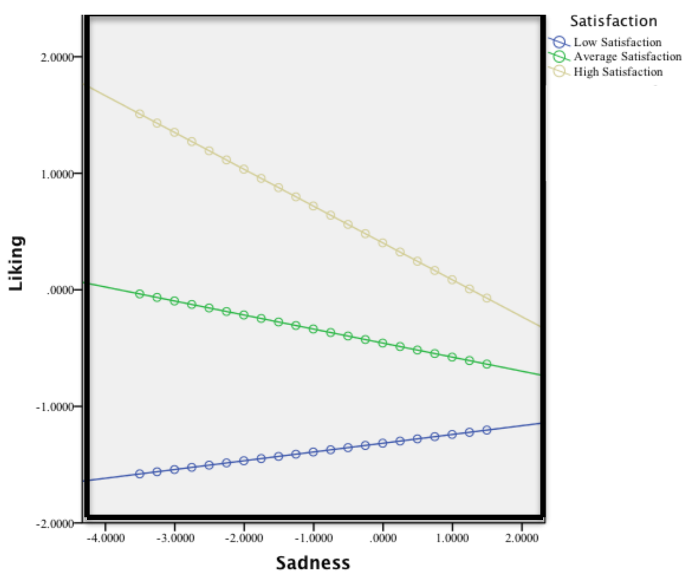

Figure 23. Satisfaction moderating sadness's effect on liking. This figure shows that average and low satisfaction did not influence the effect sadness has on liking, and that when people are high in satisfaction, they like the song less as sadness increases.

Levinson's (1997) theory that the satisfaction with the emotion is a reason why people like a slow, minor song was supported. Satisfaction did not moderate happiness, but it did moderate sadness. The participants did like the song more as their satisfaction increased , and the people with high satisfaction liked the song less as sadness increased.

Therefore, as the sadness become more intense, their liking of the song decreased, and Levinson did say that the satisfaction with sadness would only lead to liking if the sadness was not too intense..,

Is absorption a moderator in creating emotion and communion from music? Following Judd et al.'s (2001) guidelines for testing moderation in a within-subjects design, 3 tests were run: absorption predicting the difference in happiness, absorption predicting the difference in sadness, and absorption predicting the difference in communication scores. In the first analysis, absorption was used to predict the difference in happiness scores between Vivaldi and Moby (M = .79, SD = 1.08). Absorption did not significantly predict this difference, β = .19, t(83) = 1.76, p = .08. It did not explain a significant portion of the variance, either, R^2 = .04, F(1, 83) = 3.11, p = .08.

Figure 24 shows that the residuals were normally distributed (skewness = .00, SD = .26) even with 2 outliers. Even after removing the outliers, the results did not change. Absorption was still not a significant predictor of the change in happiness scores (M = .78 SD = .99, β = .18, t(81) = 1.46, p = .11. It did not explain a significant portion of the variance, either, R^2= .03, F(1, 81) = 2.66, p = .11. In Figure 25, the data appear to be linear and homoscedastic.

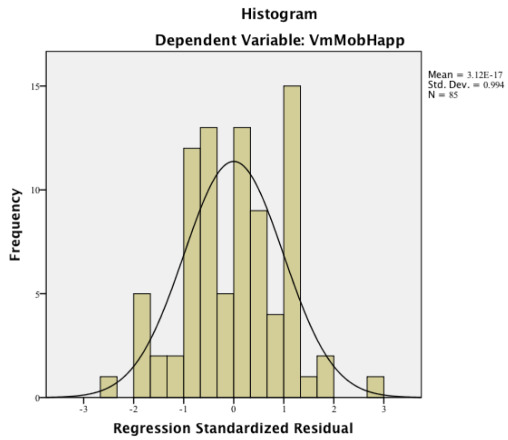

Figure 24. Histogram of standardized residuals absorption predicting the difference in happiness. This figure shows that the residuals were normally distributed, and that there were two outliers.

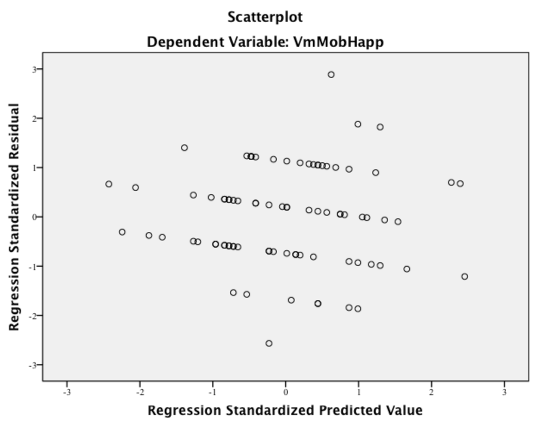

Figure 25. Scatterplot of standardized absorption scores and standardized residuals on the difference in happiness. This plot shows that the data were linear and homoscedastic.

For the second analysis, the difference in sadness scores between Debussy and Moby (M = 1.49, SD = 1.23) were obtained. Absorption was used to predict this difference but was not a significant predictor, β = -.10, t(83) = -.94, p = .35. It did not explain a significant portion of the variance, R^2 = .01, F(1, 83) = .88, p = .35.

As seen in Figure 26, the residuals were negatively skewed (skewness = -.80, SD = .26) with 1 outlier. The original sadness scores in the Moby song were positively skewed (M = .91, SD = .26), and the original sadness in scores in the Debussy song were negatively skewed (M= -.80, SD = .26). These skewed distributions were corrected by taking the natural log of the sadness scores in the Moby song and by cubing the sadness scores in the Debussy song. This procedure corrected the skewness of the residuals (*M* = -.36, *SD* = .26).

Even after correcting the negative skew, the results did not change. Absorption was still not a significant predictor of the change in sadness scores (*M* = -43.42, *SD* = .28.06), β = -.10, *t*(83) = -.87, *p* = .39. It did not explain a significant portion of the variance, either, R^2= .01, *F*(1, 83) = .76, *p* = .39. Figure 27 shows the scatterplot of the sadness and the standardized residuals on sadness. This figure shows that the data were linear and did not fail the assumption of homoscedasticity.

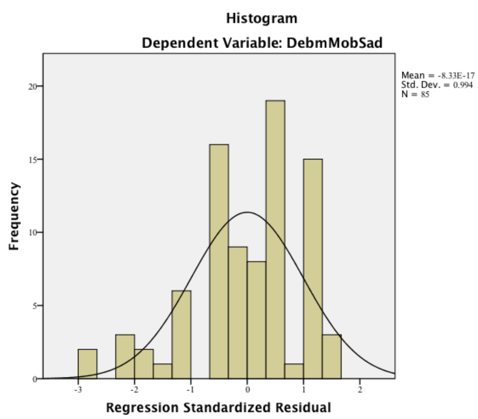

Figure 26. Histogram of standardized residuals absorption predicting the difference in sadness. This figure shows that the residuals were normally distributed, and that there was one outlier.

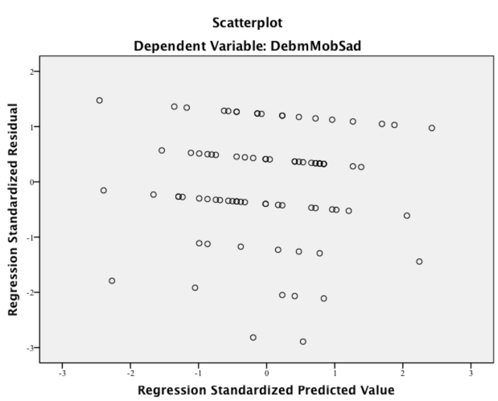

Figure 27. Scatterplot of standardized absorption scores and standardized residuals on the difference in happiness. This plot shows that the data were linear and homoscedastic.

To test absorption's moderating effect on the songs creating communication, two analyses were run. In the first analysis, communication in Vivaldi was subtracted by the communication in Moby (M = .32, SD = 1.80). Absorption was used as a predictor variable for this difference score. Absorption was not a significant predictor variable for this difference in communication, $\beta = .08$, $t(83) = .70$, $p = .49$. It also did not explain a significant portion of the variance $R^2 = .01$, $F(1, 83) = .49$, $p = .49$.

Figure 28 shows the histogram of the residuals to determine in the residuals were normally distributed and to determine if there were any outliers. These residuals were normally distributed (skewness = -.05, SE = .26), but there appeared to be 4 outliers. Even after removing the 4 outliers, the results did not change. Absorption was still not a significant predictor of the change in communication scores, $\beta = .08$, $t(79) = .76$, $p = .45$. It did not explain a significant portion of the variance, either, $R^2 = .01$, $F(1, 79) = .58$, $p = .45$. Figure 29 shows that the data were linear and did not fail the assumption of homoscedasticity.

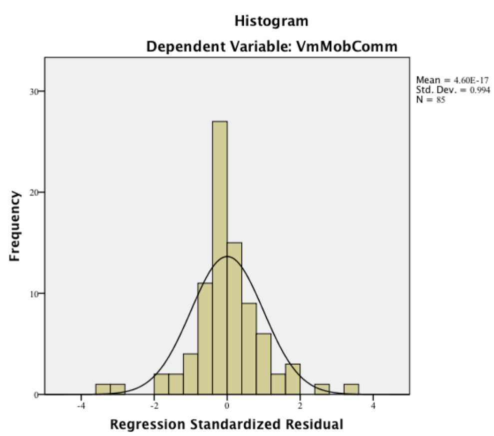

Figure 28. Histogram of standardized residuals absorption predicting the difference in communication between the Vivaldi and Moby songs. This figure shows that the residuals were normally distributed, and that there were 4 outliers.

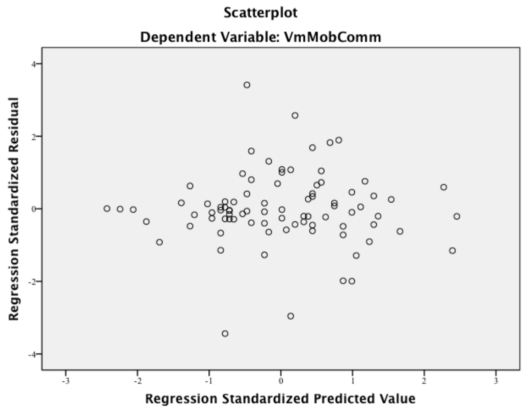

Figure 29. Scatterplot of standardized absorption scores and standardized residuals in communication in the Vivaldi and Moby songs. This plot shows that the data were linear and homoscedastic.

Communication in Debussy was subtracted by communication in Moby (M = .24, SD = 1.43). Absorption was used to predict this difference but was not a statistically significant, β = .12, t(83) = 1.06, p =.29. It did not explain a significant portion of the variance, either, R^2 = .01, F(1, 83) = 1.13, p = .29.

As shown in Figure 30, these residuals were normally distributed (skewness = .27, SD = .26), but there was 1 outlier. Even after removing the outlier, the results did not change. Absorption was still not a significant predictor of the change in communication scores (M = .30, SD = 1.35), b = .16, t(82) = 1.46, p = .15. It still did not explain a significant portion of the variance, R^2 = .02, F(1, 82) = 2.1, p = .15. Figure 31 shows the scatterplot of the sadness and the standardized residuals on communication. This figure shows that the data were linear and homoscedastic.

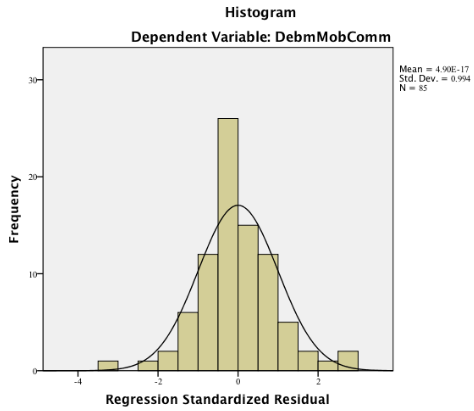

Figure 30. Histogram of standardized residuals absorption predicting the difference in communication between the Debussy and Moby songs. This figure shows that the residuals were normally distributed, and that there were 4 outliers.

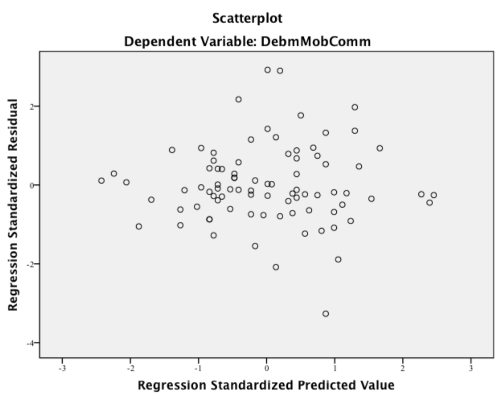

Figure 31. Scatterplot of standardized absorption scores and standardized residuals on the difference in communication in the Debussy and Moby songs. This plot shows that the data were linear and homoscedastic.

Finally, absorption was not a moderator in the song creating communion. It was not a moderator in creating happiness or sadness, either. Therefore, Levinson's (1997) idea that a person will receive a stronger reward the more absorbed he or she is was not supported.

CHAPTER V

DISCUSSION

This chapter discusses the results from Chapter IV. It examines them in terms of Levinson's (1997) and Solomon's (1980) theories and compares the results with past research. It also addresses the limitations of the study and implications for future research

Hypotheses

The songs evoked their intended emotions, and, surprisingly, absorption scores increased after listening to and rating all three songs. When the correlations were significant, they were in the intended directions. Interestingly, when absorption was significantly correlated with the other scores, it had correlations of about .30. Happiness mediated the song's effect of creating a communion, but despite these positive results, none of the hypotheses in this thesis were supported. One of Levinson's (1997) rewards from listening to sad music, Savoring Feeling, was verified. Even so, Solomon's (1980) Opponent-Process Theory could not be supported. Neither could the theory be challenged.

Does slow, minor music create a communion with the song*?* The fast, major song and the slow, minor song did not create statistically significantly higher communication scores than the repetitive song. Thus, Levinson's reward of emotional communion could not be substantiated.

Interestingly, this finding does not support past research that has shown slow, minor music creates negative effects, while fast, major music creates positive effects (Heatherton et al., 1998; Martin et al.,1988; Pignatiello et al., 1986; Teasdale & Talor, 1981). This study showed that communication scores were equally strong in fast, major music, repetitive music, and slow, minor music. This finding could indicate that communication scores do not depend on the collative properties of the music, or it could mean that it was a small effect with unfamiliar music, so more people were needed to discover it.

Do happiness and sadness mediate music's effect of creating communion? Levinson's (1997) reward of emotional experience, where the emotions mediate the song's ability to create the communion was not wholly supported, either. Levinson discusses this reward in terms of sadness creating our connection with the song. This mediation was not the case. Instead, happiness predicted the communion, which Levinson stated was also plausible.

Despite evidence that induced sadness can cause benefits (Finn & Roediger, 2011; King & Janiszewski, 2011; van Knippenberg et al., 2010; see also Jaffe, 2012 for a review), the current study did not support these findings nor did it transfer these findings to music. Emotion induction for these studies varied. They used the Velten method (King & Janiszewski, 2011), emotionally provocative pictures (Finn & Roediger, 2011), and emotional imagination (van Knippenberg et al., 2010), which are more personalized approaches to emotion induction than the procedure used in this study, because the person is forced to read sentences in the first person in the Velten Method and to imagine a situation that makes them sad in the emotional imagination method. Perhaps the participants did not place themselves in the music as they would in these other methods, or, perhaps, the sadness was not germane to them at that time, so they saw it as something negative to avoid, disregarding any benefits.

Because happiness predicted communion, these results support findings from Husain et al. (2002) but challenge findings from Ilie and Thompson (2011). In Husain et al. (2008), mood and enjoyment predicted the participants' ability to solve a paper-folding task. In Ilie and Thompson (2011), the valence evoked from the collative properties did not mediate their effect on completing a creative task. One reason the current study contradicts Ilie and Thompson may be the difference in statistical measures. Ilie and Thompson used the Baron and Kenny (1986) method, which requires the direct path to be significant as well as the mediated path for the mediator to be significant, but the statistical procedure used in this experiment (i.e., Judd et al., 2001) and other procedures (Preacher & Hayes, 2008) do not have such a requirement. Because of this difference in statistical procedures, mediation was found in the current study and Husain et al. (2002).

Happiness predicting communication finding also gave quantitative credence to Lamont (2011), who used qualitative research on strong experiences in music. Lamont had students describe an extremely emotional event related to music. Most events were described as evoking happiness. During these happy events, some people said that they found some personal meaning in their life during the musical experience (e.g., a concert) and connecting people through the music. Although it was a rare finding, communication with a song was also described as being experienced during a happy musical event, stating that the song made the participant "…ultimately extremely happy as [she] felt that [she] was no longer alone" (p. 238).

Perhaps happiness predicted having a communication with the song and sadness did not, because, as shown in Lamont (2011), college aged students more readily report a connection between happiness and connecting with and finding meaning in a piece. Alternatively, it could be that this effect is explained through Husain et al.'s (2002) mood-arousal theory. This theory merely states that a song alters mood and arousal, which impact cognitive skills, where the participants were more aroused by the happiness, which caused them to take in more information and connect more strongly with the song. Lamont (2011) also noticed that the participants reported high levels of engagement in their strong experiences in music. Perhaps the happiness caused more engagement, which would explain the higher communication scores.

Does satisfaction moderate evoked happiness's and sadness's effect on liking a song? Levinson's (1997) emotional reward of savoring feelings was supported, because the theory states that satisfaction and the emotions interact to increase liking but would only do so if the emotion was not too intense. Liking did increase as satisfaction increased, despite the fact that happiness and sadness from the songs had no effect. Interestingly, though, satisfaction did interact with sadness, the end result was that high satisfaction lowered liking as sadness increased.

For the emotion-satisfaction moderation on liking, it is difficult to compare the past research to the results directly, because the past research and theory focus on the relationship between satisfaction and a nonmusical outcome (Chang & Chen, 2005; Clair & Memmott, 2008; Galizio & Hendrick, 1972). Satisfaction and communication were significantly, positively correlated for each song in this study, but further analyses were not run on the satisfaction and communication relationship.

The satisfaction and sadness interaction on liking music is harder to explain. Given the limited research on satisfaction, it is difficult to provide a causal explanation backed by empirical or theoretical evidence as to why people with high satisfaction during the song liked the song less as their sadness increased. Liking music has been described as a three-way interaction between the person, the music, and the situation (LeBlanc, 1982). Perhaps the participants were not in a situation where they felt the increased sadness justified liking the song.

Is absorption a moderator in creating emotion and communion from music? Finally, Levinson's (1997) reward of emotional resolution was not supported. This reward claimed that absorbing oneself into the song would strengthen emotions, allowing the listener to feel true emotion from the song. Absorption did not moderate the emotions that came from the song, so this claim could not be verified. Neither could Levinson's reward of intimacy (communion) be verified, as absorption did not moderate the songs' ability to create a communication.

The absorption moderation hypotheses did not support findings from previous research, either. Sandstrom and Russo (2010) found that absorption predicted a nonmusical outcome of recovering from stress more quickly using peaceful music but not in using white noise. Even though the current study found positive, significant correlations between absorption and each song's communication scores, higher absorption scores did not predict greater differences between the songs. Perhaps the songs were too similar in other properties (i.e., instrument composition) that the more someone absorbed him or herself in the music, the similar he or she found the connection with the songs to be.

Limitations

The nonsignificant results were probably the product of several limitations within the study. Limitations are abundant in any study, but the current experiment had three major limitations. These limitations were the relatively small sample size, the unfamiliar music, and the absorption measurement.

Small sample size. Even though the current study had a decent sample size for a within-subjects design, the 85 people who participated in this study may not have been enough to uncover the effects. The sample size was almost doubled the 44 participants needed to achieve a medium effect size as determined by the power analysis using the pilot data. However, the same power analysis showed that 266 participants were needed to achieve a small effect size. Given that several of the results in this experiment were approaching significance, it could be that the nonsignificant results were largely a matter of too small a sample size.

Unfamiliar music. Another reason significant results were not discovered in this experiment could be because unfamiliar music was used. Schellenberg et al. (2008) used unfamiliar classical music to induce mood, and they found that music overall was liked more as the listener was exposed to it, and that liking for sad music increased only if people had heard the song before while doing an unrelated task. In fact, familiar music induces stronger emotions (Ali & Peynircioğlu, 2010) and chills (Blood & Zatorre, 2001) than unfamiliar music. Moreover, when people listen to their preferred genre of music, respiration rate and heart rate correlate preferring the song as well as chills. Skin conductance and emotional arousal did not. Listening to classical music had no effect (Schäfer & Sedlmeier, 2011).

Unfamiliarity with the music could moderate the strength of felt emotions. In fact, familiar songs induce stronger emotions than unfamiliar music (Bartel, 1992; Edelman et al., 2011), and music elicits emotions when it is connected to a memory (Juslin & Vastfjall, 2008). Edelman et al. (2011) did look at the ecological effects of emotional responses to music. They found that a memory associated with a song increased the induced mood. Emotions may be evoked from songs because of memories associated with the pieces, but it is still plausible that the different properties of the music caused the different emotions (Krumhansl, 2002; Thaut, 2005).

Communion can be considered a cognitive function. Because cognitive functions are rewards predicting liking of music, the music has to be “known and familiar” (Schäfer and Sedlmeier, 2009, p. 228). These effects could be due to the collative properties or the ecological associations. Basically, effects are more likely to be found when the participants listen to their preferred music or to music that they had heard before. Therefore, using unfamiliar music was a hindrance in this study.

Absorption measurement. Another limitation to this study was that absorption was measured as a personality trait variable instead of a state variable. There is an argument that absorption could be a trait, a state, or both (Roche & McConkey, 1990). To date, this argument has not been settled.

Herbert (2012) attempted to solve this dilemma through a 2-week diary study by having 20 participants discuss their musical and nonmusical experiences in which they were absorbed. Eight weeks after the diary study, the participants also took a measure of absorption as a personality trait. All of the participants experienced absorption as a state, but they were allowed to record as many or as little states as they wanted, which made finding the connection between state and trait absorption untenable.

Essentially, the current study did increase the participants’ level of absorption after listening to the songs. This finding suggests that absorption is measurable as a state through the AIMS. The correlations, however, suggest that the AIMS measures absorption as a trait because of the .30 correlations between the AIMS and several measures in each song. The current study assumed that trait and state absorption would at least be positively correlated, but there is no evidence for or against that assumption. Because absorption scores were higher after they listened to the songs than before they listened to the songs, maybe re-analyzing the results with only the post-music absorption scores would validate Levinson's (1997) theory.

Satisfaction. The last limitation discussed in this paper is the measurement of satisfaction. Because the participants were only asked to mark how strongly they felt satisfied after listening to the piece, it is impossible to know the origins of the satisfaction. The emotions felt during the song could have caused the satisfaction, or the songs themselves could have caused the satisfaction. This variable was loosely defined based on each participant's interpretation.

Implications

Future research. The relatively small sample size, the use of unfamiliar music, and the use of an absorption measure that measures trait absorption are all limitations that need to be addressed in future studies on this topic. Addressing these issues would help determine if the effects designed in this experiment are significant with different controls. It is possible, though, that they cannot be found, in which case other variables need to be introduced to the model.

One variable to add is memories associated with the music. As discussed in Edelman et al (2011), future research should also investigate the effects that memories have on the liking of and the emotional arousal from listening to sad music. Furthermore, Zink (1960) philosophizes that one has to experience the emotion in art to appreciate fully the work and that the sadness during a song does not come from the music but from the memories associated with the music. Indeed, listening to sad music causes people to remember negative past life experiences (Teasdale & Talor, 1981). Although people recall more happy memories when listening to happy music compared to sad, neutral, and no music. There was no difference in the number of sad memories recalled despite the overall increase in the number of childhood memories recalled when playing music (Martin & Metha, 1997). Exploring memories within this model is important to the activation in the right temporal lobe. Intensely emotional music causes increases in blood flow to the right temporal cortex of the brain, which may be caused by their memories combining with their experiences with the music. This blood flow is greater than when listening to neutral music (Alfredson, Risberg, Hagberg, & Gustafson, 2004). This right hemisphere activation supports Chabris's (1999) claim developed after analyzing a meta-analysis of "Mozart Effect" studies that the nonmusical outcomes associated with this effect are caused by enjoying the music.

Despite not being able to verify most of Levinson's (1997) rewards tested in this experiment, this experiment did not test all of his rewards. One of these rewards was called expressive potency. Emotional potency is described as the song matching the current mood of the listener, which provides satisfaction. Schäfer and Sedlmeier (2011) found that changes in emotional states affected preferences for songs. They had participants watch their own emotional reactions to music in a mirror modality and found that the song that was played after the participants watched themselves in the mirror was preferred the most out of the three songs, but this effect was weak. It does show that a person's current perceptions, or moods, can alter music's effect on a person. Similar effects were also found in Friedman, Gordis, and Forster (2012). Therefore, Levinson's emotional potency reward should be evaluated more closely.

Perhaps most importantly, more research should investigate causal factors of why satisfaction predicts increased liking, the difference between satisfaction and liking, and the causes of feeling satisfied. Because this study loosely defined satisfaction variable but still found significance, future research needs to address reasons for being satisfied while listening to a song. Future research should also determine why people who receive high satisfaction also like the song less as their sadness increases. These relationships are under researched and need closer examinations.

Clinical application. Despite the lack of support for Levinson's (1997) rewards, these results have clinical applications in a music therapy setting. Therapeutically, these results suggest that nonmusical outcomes do not come from the collative properties of the music, which suggests that music therapists can play a variety of music undeterred by the music's composition. According to these results, the music should be music that makes the person happy, because happiness mediated the nonmusical outcome from the song, but sadness had no effect (positive or negative) on the outcome. Interestingly, and perhaps counter intuitively, this happiness can come from the music that is intended to make the listener sad. If slow, minor (or sad) music is chosen for an intervention, then it should be music from which the client receives a lot of satisfaction, because that is the music he or she prefers. Also, the highly satisfying music cannot induce a lot of sadness, because the client will not prefer it. Perhaps these results suggest that a client who has a high negative affect (e.g., depression) would prefer sad music, because he or she would possibly receive satisfaction with the music. Plus, it would not induce more sadness, because people with depression have reduced reactions to sad stimuli (Rottenberg, 2005).

Conclusion

Most of Levinson's (1997) ideas were not supported in this study, but his idea of Savoring Feeling was supported. It was found that people like music, whether it evokes sadness or happiness, more as their satisfaction increases, but this is only true if too much sadness is not evoked in people who feel high satisfaction with the song. Supporting the mood-arousal theory (Husain et al., 2002), feeling happiness with the song positively predicted having a communication with the song. Because one of Levinson's rewards was unearthed in these data, it is possible to say that people like music that makes them sad because of some benefit they receive from it. This statement is due the fact that it is possible to say that the more satisfaction you have with the song, the more you will like it, as long as it does not make you too sad.

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APPENDIX A

EMOTION RESPONSE QUESTIONNAIRE

Please indicate the strength of each emotion your felt while listening to this song.

Emotion	Not Felt At All	Felt A Little	Somewhat Felt	Felt Strongly	Extremely Intense Emotion
Happiness	1	2	3	4	5
Sadness	1	2	3	4	5
Satisfied	1	2	3	4	5
Engaged	1	2	3	4	5

APPENDIX B

DEMOGRAPHICS QUESTIONNAIRE

Age: ______

Year in College (Circle one): Freshman Sophomore Junior Senior Graduate

Gender (Circle one): Male Female

Ethnicity (Circle One): Caucasian African-American Asian Native American

Other:______________________________

Are you a musician or vocalist? Yes No

Please indicate the amount of training you have had in playing or singing music:

None at All	A Little	Some	A Fair Amount	A lot
1	2	3	4	5

What one genre/type of music do you listen to the most? _________________________

How important is music to you in your life?

Not at All	A Little	Some	A Fair Amount	A lot
1	2	3	4	5

What song makes you sad when you listen to it? ______________________________

What song makes you happy when you listen to it? ____________________________